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UTAH FLORA: FABACEAE (LEGUMINOSAE)

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ABSTRACT.— A revision of the legume family, Fabaceae (Leguminosae), is presented for the state of Utah. Included are 244 species and 60 varieties of indigenous and introduced plants. A key to genera and species is provided, along with detailed descriptions, distributional data, and pertinent comments. Proposed new taxa are *Astragalus lentiginosus* Dougl. ex Hook. var. *wahweapensis* Welsh; *Astragalus subcinereus* A. Gray var. *basalticus* Welsh; *Hedysarum occidentale* Greene var. *canone* Welsh; *Oxytropis oreophila* A. Gray var. *juniperina* Welsh; and *Trifolium andersonii* A. Gray var. *friscanum* Welsh. New combinations include *Astragalus bisulcatus* (Hook.) A. Gray var. *major* (M. E. Jones) Welsh; *Astragalus consobrinus* (Barneby) Welsh; *Astragalus pubentissimus* Torr & Gray var. *peabodianus* (M. E. Jones) Welsh; *Lathyrus brachycalyx* Rydb. var. *zionis* (C. L. Hitchc.) Welsh; *Lathyrus lanzwertii* Kellogg var. *arizonicus* (Britton) Welsh; *Lathyrus langwertii* Kellogg var. *laetivirens* (Greene) Welsh; *Lupinus argenteus* Pursh var. *moabensis* (Dunn & Harmon) Welsh; *Lupinus argenteus* Pursh var. *rubricaulis* (Greene) Welsh; *Lupinus caudatus* Kellogg var. *argophyllus* (A. Gray) Welsh; *Lupinus caudatus* Kellogg var. *cutleri* (Eastw.) Welsh; *Lupinus pusillus* Pursh var. *rubens* (Rydb.) Welsh; *Lupinus sericeus* Pursh var. *barbiger* (S. Wats.) Welsh; *Lupinus sericeus* Pursh var. *marianus* (Rydb.) Welsh; *Oxytropis besseyi* (Rydb.) Blankinship var. *obnapiformis* (C. L. Porter) Welsh; *Psoralea lanceolata* Pursh var. *stenostachys* (Rydb.) Welsh.

This paper is the second in a series of works leading to a definitive treatment of the flora of Utah. The first paper dealt with the Brassicaceae (Great Basin Nat. 37: 279–365. 1977). The legume family, with 304 taxa, is one of the largest present in the state, apparently ranked second after the Asteraceae, but in third place following the Poaceae if only the 244 specific taxa are counted. Adventive plants account for 45 species, or about 15 percent of the total taxa in the family. This is fewer than the 18 percent determined for the Brassicaceae. Weedy species represent only a small proportion of the adventive taxa; the bulk consists of cultivated crop and ornamental plants. More than half of the 45 legume genera in Utah are known from introduced plants. The 24 introduced genera account for only 30 species, however. It seems un-

likely that other large families will be represented by such a large percentage of adventive genera. The remainder of the introduced species are in genera with indigenous species in Utah.

The largest genus of legumes, and probably of any plant family in Utah, is *Astragalus* with 110 species and 36 varieties. This genus has long proved troublesome to taxonomists, partly because of its great size, and partly because of the complex nature of some species.

The definitive treatment by Dr. Rupert C. Barneby provides a basis for understanding of *Astragalus*, and this treatment is dedicated to him. Generally, the specific and infraspecific lines are rather sharply drawn, but in the *Astragalus lentiginosus* complex taxa apparently grade through series of morphological intermediates. Some

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30 taxa within *Astragalus*, almost a quarter of the total, are endemic to Utah often on highly specialized soil types. The currently proposed lists of endangered or threatened plants are replete with *Astragalus* taxa.

It is difficult to find a portion of Utah where one or more species of *Lupinus* are not present. Annual species are more common at lower elevations, but some occur at middle and even upper elevations. Specific lines are more easily drawn among annual species. Perennials occur as complex groups which tend to intergrade in endless entanglements. Because of these problems, species lines have been subject to interpretation, and only the careful work of Dr. David Dunn and his students has allowed meaningful interpretation of Utah lupine materials.

Oxytropis is less complex in Utah than elsewhere, primarily due to the low number of species and to the geographical isolation of taxa known to hybridize elsewhere. Only *O. oreophila* exhibits a wide spectrum of variation in the state.

Trifolium consists of both indigenous and introduced species which are markedly distinct, both morphologically and geographically. The Old World introductions listed are among our most important forage plants.

The legume family is economically important because of utilization of plants as food for man and animals. Some representatives are poisonous and have harmed livestock in the state. These are noted within the text.

Perhaps the most economically important crop derived from this family is alfalfa or

lucerne (*Medicago sativa*). Thousands of acres are planted to this forage crop in Utah.

The writer follows the example found in Barneby (1964, Atlas of North American *Astragalus*) in citing the number of specimens of each species examined. The numbers follow the discussion of each taxon, with the Arabic numerals indicating the total number seen and the Roman numerals the number collected by me.

FABACEAE Lindley
Legume Family

Herbs, shrubs, or trees; leaves alternate, pinnately or palmately compound, or simple, stipulate; flowers perfect, irregular or regular, usually borne in racemes; calyx 5-lobed; petals 5 (a banner, 2 wings, and 2 keels) or fewer, less commonly reduced to 1 (banner), or lacking; stamens 10 or 5, or numerous, diadelphous, monadelphous, or distinct; pistil 1, the ovary superior, 1- or 2-loculed, 1-carpelled, the style and stigma 1; fruit (pod) a legume or loment, sessile, subsessile, stipitate, or with a gynophore, dehiscent or indehiscent.

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- 1. Flowers regular, in dense heads or compact spicate racemes; stamens numerous (Mimosoideae) Key I
- Flowers irregular (only slightly so in some); stamens 10 or fewer 2
- 2(1). Corolla not papilionaceous, sometimes nearly regular, the upper petal enclosed by the others; stamens 10 or fewer, commonly distinct (Caesalpinoideae) Key II
- Corolla papilionaceous, the upper petal (banner) enclosing the wing and keel petals in bud, much reduced in *Amorpha*, or lacking in *Dalea*, *Psoralea*, and *Parryella*; stamens 10 or 5 (Papilionideae) 3

- 3(2). Plants woody; trees, shrubs, or woody vines Key III
- Plants herbaceous perennials or annuals 4
- 4(3). Leaves even-pinnate Key IV
- Leaves odd-pinnate or simple 5
- 5(4). Leaflets 3 only Key V
- Leaflets 5 or more, or the leaves simple Key VI

KEY I

Flowers regular: stamens numerous (Mimosoideae)

- 1. Trees, unarmed, cultivated; flowers in umbellate heads; stamens long-exserted, the filaments commonly 20–30 mm long *Albizia*
- Trees or shrubs, armed, indigenous; flowers in spicate racemes; stamens included or shortly exserted, the filaments less than 5 mm long 2
- 2(1). Spines recurved; pods flat, 10–20 mm broad, brown at maturity *Acacia (greggii)*
- Spines straight; pods spirally coiled or if flattened then less than 10 mm broad and yellowish to tan at maturity *Prosopis*

KEY II

Corolla not papilionaceous (Caesalpinoideae)

- 1. Plants herbaceous perennials; flowers yellow; indigenous to southeastern Utah *Hoffmanseggia*
- Plants trees or shrubs; flowers variously colored; indigenous or introduced 2
- 2(1). Leaves simple, the blades rotund-ovate; flowers pink, appearing before the leaves *Cersis*
- Leaves once or twice compound; flowers yellow, white, or greenish, appearing after the leaves 3
- 3(2). Shrubs; flowers with yellow petals, the exserted stamens to 50 mm long or more; cultivated and naturalized in Washington Co. *Caesalpinia*
- Trees; flowers with white or greenish-yellow petals, the stamens included or not much exserted; distribution broad 4
- 4(3). Leaves once to twice pinnate; branches often armed; flowers greenish-yellow, borne in spicate racemes; pods long and strap-shaped *Gleditsia*
- Leaves bipinnate; branches unarmed; flower white, long-stalked, in open panicles; pods thick *Gymnocladus*

KEY III

Trees, shrubs, or woody vines (Papilionideae)

- 1. Leaves even-pinnate, the rachis produced apically as a bristle; flowers yellow *Caragana*
- Leaves simple or odd-pinnate; flowers variously colored 2
- 2(1). Leaves simple or the lower ones 3-foliolate; plants shrubs; flowers yellow; solitary or borne in erect racemes 3
- Leaves compound; plants varying in one or more ways from above 4

- 3(2). Calyx split above hence 1-lipped, with 5 minute teeth; flowers borne in erect racemes; Washington Co. *Spartium*
- Calyx bilabiate, the upper lip 2-lobed, the lower 3-lobed; flowers mostly solitary axillary; Weber Co. *Cytissus*
- 4(2). Plants twining woody vines; flowers large and showy, borne in terminal, pendulous racemes *Wisteria*
- Plants trees or shrubs; flowers various, usually borne in axillary, erect or pendulous racemes 5
- 5(4). Leaflets 3; flowers yellow, borne in pendulous racemes *Laburnum*
- Leaflets 5 or more; flower white, pink, indigo, or yellow, borne in erect or spreading racemes 6
- 6(4). Herbage glandular-punctate; indigenous shrubs with petals indigo or lacking .
..... 7
- Herbage not glandular-punctate; cultivated or indigenous shrubs or trees; petals white, pink, or yellow, or if indigo (as in *Amorpha*) then the corolla reduced to a single petal (the banner) 8
- 7(6). Petals lacking; leaflets linear; plants of Grand and San Juan Co. *Parryella*
- Petals present; leaflets broad; plants of southern and southeastern Utah
..... *Psorothamnus*
- 8(6). Petals 1, the banner only present, indigo; sparingly cultivated shrubs
..... *Amorpha*
- Petals 5, white, pink, or yellow; shrubs or trees, sparingly to commonly cultivated 9
- 9(8). Plants shrubs; pods bladdery-inflated; flowers yellow; ornamental and road-side plants *Colutea*
- Plants trees or shrubs; pods flat or terete; flowers white or pink 10
- 10(9). Branches armed with stipular spines or internodal hispid processes; staminal filaments diadelphous; petals pink or white *Robinia*
- Branches unarmed; staminal filaments distinct; petals white 11
- 11(10). Leaf bases hollow, covering superposed buds; pods flat, not constricted between the seeds *Cladrastis*
- Leaf bases solid, not covering buds; pods terete, constricted between the seeds *Sophora*

KEY IV

Leaves even-pinnate (Papilionideae)

- 1. Flowers yellow; fruit ripening below ground, tardily dehiscent, constricted between the seeds *Arachis*
- Flowers white, pink, red, lavender, or cream; fruit borne above ground, not constricted between the seeds 2
- 2(1). Style strongly dilated; sepals foliaceous; plants cultivated *Pisum*
- Style not strongly dilated; sepals not foliaceous; plants indigenous or cultivated 3

- 3(2). Style bearded down one side; wings of corolla essentially free from the keel .
..... *Lathyrus*
- Style bearded in a tuft or ring at apex; wings of corolla adherent to the
keel *Vicia*

KEY V
Leaflets three (Papilionideae)

- 1. Leaves palmate, the terminal leaflet neither stalked nor jointed 2
- Leaves pinnate, the terminal leaflet stalked or jointed 4
- 2(1). Flowers golden-yellow, the banner orbicular, large; legumes narrowly ob-
long, erect or ascending; staminal filaments distinct *Thermopsis*
- Flowers ochroleucous to white or pink to pink-purple, the banner not or-
bicular, moderate to small in size; staminal filaments diadelphous 3
- 3(2). Leaflets usually toothed; flowers mostly in heads, commonly pink or white
..... *Trifolium*
- Leaflets entire; flowers not in heads, commonly ochroleucous or pink
..... *Astragalus*
- 4(1). Herbage glandular-punctate; indigenous plants with usually linear to oblan-
ceolate leaflets *Psoralea*
- Herbage not glandular-punctate; indigenous or cultivated plants with spatu-
late to obovate or oblanceolate to ovate leaflets 5
- 5(4). Leaflets entire 6
- Leaflets toothed (except in some *Trifolium* species) 8
- 6(5). Flowers in umbels, loosely capitate, or solitary in leaf axils, yellow or suf-
fused with orange *Lotus*
- Flowers in interrupted racemes or panicles, purplish 7
- 7(6). Leaflets stipellate; pods several seeded, several to many times longer than
broad *Phaseolus*
- Leaflets lacking stipels; pods 1-seeded, only somewhat longer than broad
..... *Lespedeza*
- 8(5). Flowers usually in heads; corolla persistent, investing the fruit; fruit straight
..... *Trifolium*
- Flowers usually in racemes; corolla not persistent; fruit straight or curved to
coiled 9
- 9(8). Leaflets toothed along the distal ½ or more; racemes elongate, several times
longer than broad *Melilotus*
- Leaflets toothed along the distal ⅓ only (except in some *Trigonella*); racemes
compact or loose, seldom more than twice longer than broad 10
- 10(9). Fruit straight or falcately curved, prominently veined on the valves; flowers
yellow; terminal leaflet with an apical spinose cusp, rarely as much as twice
longer than broad; plants rare *Trigonella*
- Fruit coiled or curved, veined or not; flowers pink, lavender, whitish, or yel-
low; terminal leaflet seldom strongly cuspidate apically, usually more than
twice longer than broad; plants common *Medicago*

KEY VI

Leaflets (4) 5 or more, or simple (Papilionideae)

1. Leaves palmately compound, with usually 5-11 leaflets, long-petiolate 2
- Leaves pinnately compound, or if rarely palmately compound (as in some *Lotus* species), then sessile or with only 4 leaflets 3
- 2(1). Herbage glandular-dotted; leaflets usually 5, broadly obovate-spatulate; stamens usually diadelphous; pods 1-seeded *Psoralea*
- Herbage not glandular-dotted; leaflets usually 7-11, variously shaped; stamens monadelphous; pods several-seeded *Lupinus*
- 3(1). Herbage glandular-dotted 4
- Herbage not glandular-dotted 5
- 4(3). Racemes spicate; legumes 1-seeded, not bearing appendages; stamens 5; petals (except banner) inserted on staminal tube *Dalea*
- Racemes not spicate; legumes several-seeded, bearing hooked appendages; stamens 10; petals not inserted on staminal tube *Glycyrrhiza*
- 5(3). Terminal leaflet of lower leaves several times larger than the lateral; inflorescence of many-flowered head closely subtended by foliose involucre bracts; flowers yellow; introduced, rare *Anthyllis*
- Terminal leaflet not much larger than the lateral; inflorescence a raceme or an umbel, lacking foliose bracts (except in *Lotus*); flower color various 6
- 6(5). Margin of leaflets toothed; corolla persistent, investing the fruit *Trifolium*
- Margin of leaflets entire; corolla usually deciduous 7
- 7(6). Flowers in umbels, loosely capitate, or solitary in leaf axils; petals yellow, often suffused with orange, or pink 8
- Flowers in racemes or cymes; petals usually not yellow 9
- 8(7). Leaflets 3-5; flowers yellow *Lotus*
- Leaflets 9-23; flowers pink to pink-purple *Coronilla*
- 9(7). Keel petals much longer than the wings; fruit a flattened loment 10
- Keel petals subequal to the wings or shorter; fruit a legume (a terete loment in *Sophora*) 11
- 10(9). Fruit 4- to several-seeded, not spiny (except in *H. boreale* var. *gremiale*); plants indigenous *Hedysarum*
- Fruit 1- to 2-seeded, more or less spiny-toothed; plants adventive, cultivated and escaping *Onobrychis*
- 11(9). Stipules spiny; flowers dirty whitish *Peteria*
- Stipules various, but not spiny; flowers seldom if ever dirty whitish 12
- 12(11). Staminal filaments distinct; fruit a terete to somewhat flattened loment; plants with blue or white flowers, usually of sandy sites *Sophora*
- Staminal filaments diadelphous or monadelphous; fruit a legume; plants from a caudex and/or taproot, rarely rhizomatous; habitats various 13
- 13(12). Keel with a porrect beak; ventral suture of legume forming a partial or complete partition; plants usually acaulescent *Oxytropis*

- Keel beakless, or the beak diverging from the floral axis; ventral suture usually not produced internally, the dorsal usually produced in bilocular fruits; plants usually caulescent 14
- 14(13). Stamens monadelphous; flowers blue *Galega*
- Stamens diadelphous; flowers pink-purple, pink, lavender, ochroleucous, red, white, or variously suffused, but not blue 15
- 15(14). Flowers red-orange when fresh; plants adventive *Sphaerophysa*
- Flowers pink, pink-purple, lavender, or white to ochroleucous; plants indigenous, or rarely adventive *Astragalus*

ACACIA P. Miller

Armed trees; leaves alternate, often clustered on short axillary shoots, bipinnate, petiolate, the pinnae bearing several leaflets; internodal spines curved; stipules small and deciduous; flowers numerous, borne in elongate spikes; calyx 5-lobed; corolla regular, 5-lobed, inconspicuous; stamens numerous, included, distinct; ovary substipitate; pods flattened, indehiscent.

Acacia greggii A. Gray. Catclaw Acacia. Small trees to 4 m tall, the branches armed with curved internodal spines; leaves to about 4 cm long, with 2 pairs of pinnae, each with 4-6 pairs of obovate to oblong leaflets 3-6 mm long, puberulent on both surfaces; petioles 2-5 mm long, bearing a solitary gland between the lower pair of pinnae; spikes mostly 3-6 cm long (including peduncles); flowers fragrant, 2-2.5 mm long; petals greenish, like the sepals; legumes flattened, oblong, usually curved, 50-100 mm long, 10-20 mm wide, constricted between the seeds; seeds 5-7 mm broad, nearly circular. Warm desert shrub, drainage-terrace vegetation, at about 870 m in Washington Co.; Nevada, California, Arizona, New Mexico, Texas, and Mexico. Our material belongs to var. *arizonica* Isely.

ALBIZIA Durazzini

Unarmed trees; leaves alternate, not clustered, bipinnate, petiolate, the several pairs

of pinnae each with numerous oblique leaflets; stipules small and caducous; flowers several to many, in umbellate heads; calyx tubular, 5-lobed; corolla united, funnelform, the 5 lobes shorter than the tube; stamens numerous, united into a tube basally, long-exserted; pods flattened, dehiscent.

Albizia julibrissin Durazzini. Silk-tree, Mimosa. Small tree to 3 m tall or more and as broad or broader; leaves to 25 cm long or more (including petiole), with 5-10 (15) pairs of pinnae, each with 12-25 (30) pairs of leaflets 7-15 mm long, puberulent, if at all, on rachis and leaflet margins; petioles 3-6 cm long, each with a single large flattened gland; calyx 3-3.5 mm long; corolla 7.5-9.5 mm long, cream to greenish; staminal filaments exserted 20-30 mm, brightly rose-pink to reddish in color; pods 120-200 mm long, 15-25 mm wide, oblong, flattened, membranous. Cultivated ornamental at lower elevations in much of Utah, but frost sensitive; introduced from Asia.

AMORPHA L.

Cultivated shrubs; leaves alternate, odd-pinnate, the leaflets marked with dots, usually with stipels; flowers purple, borne in terminal spicate racemes; calyx 5-toothed, persistent; banner present (wings and keel lacking), wrapped around the stamens and style; stamens 10, monadelphous at the base only, otherwise distinct; pods 1- to 2-seeded, tardily dehiscent.

- 1. Plants usually less than 1 m tall; petioles short, usually shorter than width of lowest leaflets *A. canescens*
- Plants usually more than 1 m tall; petioles elongate, longer than the width of the lowest leaflets *A. fruticosa*

Amorpha canescens Pursh. Lead Plant. Subshrub, the erect branches, mostly 4–10 dm tall, the herbage densely white-villous; leaves subsessile, 2.5–12 cm long, with 15–51 leaflets, these elliptic to lance-elliptic or oblong, green above, white-hairy beneath; racemes clustered, paniculate; calyx tube white-villous; pods white-villous, the style almost as long as the body. Cultivated ornamental in some communities in northern Utah (Reimschuessel s.n., BRY); introduced from the Great Plains; indigenous from Canada south to Texas and New Mexico.

Amorpha fruticosa L. False Indigo, Bastard Indigo. Shrub to 3 m tall or more, the herbage sparingly pubescent to glabrate; leaves long-petioled, with 13–35 leaflets, these elliptic to oblong, green on both sides, the lower only somewhat paler and strigulose; racemes clustered, paniculate; calyx tube glabrous; pods glabrous, the style much shorter than the body. Cultivated ornamental and botanical curiosity in northern Utah (Vickery 1085, 2252, UT); introduced from eastern United States; indigenous in much of eastern North America and south-westward to Arizona.

ANTHYLLIS L.

Cultivated herbaceous perennial; leaves odd-pinnate; stipules small, adnate the petiole, the lowermost somewhat sheathing; flowers many, borne in pedunculate heads or head-like clusters; calyx tubular, 5-lobed; corolla papilionaceous; stamens 10, monadelphous; pods invested by the accrescent calyx, 1- or few-seeded.

Anthyllis vulneraria L. Kidney Vetch, Woundwort. Stems arising from a caudex, 8–30 cm tall, decumbent to erect; leaves 2–7 cm long, odd-pinnate, with usually 5–9 leaflets, the terminal leaflet of lowermost leaves much larger than the lateral ones; peduncles 5–16 cm long, usually with a foliose bract below the inflorescence; heads 1 to few, each closely subtended by foliose bracts; flowers 10–15 mm long, sessile, yellow (or suffused with red); calyx pilose, much inflated at maturity. Introduced forage and reseeding plant, known from Sanpete Co. (Stevens 364, BRY), but to be expected elsewhere; indigenous to Eurasia.

ARACHIS L.

Cultivated annual herbs; leaves even-pinnate, lacking tendrils; stipules prominent, long-attenuate, adnate to the petiole and almost sheathing the stem; flowers yellow, papilionaceous, few or solitary in the axils, sessile, hypanthium elongating and pushing developing ovary underground; stamens diadelphous, usually 9 and 1; pods maturing underground, indehiscent, constricted between the seeds.

Arachis hypogaea L. Peanut. Stems from a taproot, mostly 20–50 cm tall; leaves mostly 4–15 cm long, even-pinnate, with 2 pairs of leaflets, 2.2–6 cm long, 0.8–2.5 cm wide, entire; stipules 20–35 mm long; flowers yellow, soon withering, usually only the lowermost producing fruits. Sparingly cultivated plants, rarely escaping but not persisting, in Utah; introduced from Brazil (?).

ASTRAGALUS L.

Plants annual or perennial, caulescent or acaulescent, from a taproot, a caudex commonly developed, rarely with a rhizome; leaves alternate, odd-pinnate, trifoliate, or simple; stipules adnate to the petiole base, sometimes connate-sheathing around the stem; flowers papilionaceous, in axillary racemes, each subtended by a single bract; bracteoles 1 or 2 or lacking, attached at base of calyx or on pedicel; calyx 5-toothed; petals 5, pink, lavender, pink-purple, orcholeucous, or white, or variously suffused, the keel shorter than the wings, rounded to attenuate apically; stamens diadelphous; ovary enclosed in the staminal sheath, the style glabrous; pods variable in size, shape, and dehiscence, unilocular to bilocular, sessile, subsessile, or stipitate (or with a gynophore). Note: This is a large and complex genus, certainly the largest genus of flowering plants in Utah, and because of this, the keys to species are constructed as to reflect political geographic subdivisions of the state. This makes it possible to identify unknown plants without the effort of struggling through a single interminably long key. Keys and descriptions are based on some 3800 specimens from Utah, a quarter of them collected by the author.

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1.	Plants of northwestern Utah (i.e., Box Elder, Cache, Davis, Juab, Morgan, Salt Lake, Tooele, Utah, and Weber counties)	Key I
—	Plants not from northwestern Utah	2
2(1).	Plants of south-central and southwestern Utah (i.e., Beaver, Iron, Millard, Piute, Sanpete and Sevier counties)	Key II
—	Plants not from south-central and southwestern Utah	3
3(2).	Plants of Washington County	Key III
—	Plants not of Washington County	4
4(3).	Plants of northeastern Utah (i.e., Daggett, Duchesne, Rich, Summit, Uintah, and Wasatch counties)	Key IV
—	Plants of east-central and southeastern Utah	5
5(4).	Plants of Carbon, Emery, and Wayne counties	Key V
—	Plants of Garfield, Grand, Kane, and San Juan counties	6
6(5).	Plants of Grand and San Juan counties	Key VI
—	Plants of Garfield and Kane counties	Key VII

KEY I

Plants of Box Elder, Cache, Davis, Juab, Morgan, Salt Lake, Tooele, and Weber counties

1.	Plants prostrate; leaves to 1 cm long, with spinulose-tipped leaflets all decurrent; usually of high elevations	<i>A. kentrophyta</i>
—	Plants of various habit; leaves often more than 1 cm long, not or rarely spinose, the lateral ones usually jointed to the rachis; distribution various	2
2(1).	Leaves all simple; plants strictly acaulescent; dwarf, mat-forming plants of high elevations in Cache Co.	<i>A. spatulatus</i>
—	Leaves with (3) 5-25 leaflets or more, or only the uppermost simple; plants caulescent or acaulescent, of low to high elevations	3
3(2).	Plants rush-like or sprawling, with slender leaflets, or the uppermost leaves often simple, the terminal leaflet confluent with the rachis	4
—	Plants not rush-like, the leaflets various but usually not slender and with the uppermost leaves simple, the terminal leaflet jointed to the rachis	8
4(3).	Flowers 15-19 mm long; stems arising from a superficial woody caudex	5
—	Flowers less than 10 mm long; stems arising from a slender, sub-rhizomatous, subterranean caudex	6
5(4).	Flowers ochroleucous; calyx brown; legumes long-stipitate, pendulous	<i>A. lonchocarpus</i>

- Flowers bicolored, pink-purple with white wing-tips; calyx purplish; legumes sessile, erect *A. toanus*
- 6(4). Pods bladdery-inflated; pubescence of malpighian (dolabriform) hairs; stems usually sprawling *A. ceramicus*
- Pods oblong, not inflated; pubescence of basifixed hairs; stems erect 7
- 7(6). Leaflets and leaf rachis commonly expanded into flat, grass-like blades; ovules 10-16; pods mostly 10-17 mm long, 3-3.7 mm broad; plants of moist meadows and streambanks, rare *A. diversifolius*
- Leaflets and leaf rachis usually very narrow; ovules more than 17; pods 25-45 mm long, 2.5-3.3 mm broad; plants of dry hillsides, common *A. convallarius*
- 8(3). Calyx tube less than 4 mm long, campanulate or short-cylindric 9
- Calyx tube more than 4 mm long, cylindric to long-cylindric 18
- 9(8). Plants acaulescent, with a distinctive thatch of persistent leaf bases; pods bladdery inflated; dwarf, at high elevations in western ranges, rare *A. platytropis*
- Plants short- to long-caulescent, not with marcescent leaf bases; pods various; of low to high elevations 10
- 10(9). Plants annual, from slender taproots, usually of low elevation arid sites 11
- Plants perennial, with well-developed caudices; commonly montane 12
- 11(10). Pods bladdery-inflated, unilocular; flowers 3 or more per raceme; plants of sandy sites *A. geyeri*
- Pods curved-oblong, bilocular or nearly so; flowers often 1 or 2 per raceme; plants of various soils *A. nuttallianus*
- 12(10). Stipules all distinct, not connate-sheathing around the stem 13
- Stipules connate-sheathing around the stem, at least the lowermost 14
- 13(12). Pods bladdery-inflated, bilocular; leaflets oblanceolate or broader; flowers pale *A. lentiginosus*
- Pods oblong, not inflated, unilocular; leaflets narrowly oblong; flowers dirty purplish *A. pinonis*
- 14(12). Pubescence malpighian; pods falcately curved, bilocular *A. falcatus*
- Pubescence basifixed; pods straight, unilocular 15
- 15(14). Flowers ochroleucous; pods stipitate, either laterally flattened or bisulcate; inflorescence several times longer than broad 16
- Flowers usually some shade of pink or lavender, sometimes as above; pods stipitate or sessile, neither strongly flattened nor bisulcate 17
- 16(15). Stipules turning black on drying; flowers usually 15 or fewer; pods strongly laterally compressed *A. tenellus*
- Stipules not turning black on drying; flowers usually many more than 15; pods bisulcate *A. bisulcatus*
- 17(15). Keel with a prominent upturned beak; pods and ovaries sessile, laterally compressed; plants common *A. miser*

—	Keel merely rounded apically; pods and ovaries stipitate, 3-angled; plants rare	<i>A. alpinus</i>
18(8).	Plants acaulescent or subacaulescent, the internodes seldom apparent, the stems then prostrate; herbage usually grayish-hairy	19
—	Plants caulescent, the internodes not obscured by leaf bases and stipules (subacaulescent in <i>A. megacarpus</i>); stems usually erect or ascending; herbage commonly green	26
19(18).	Wing tips bilobed; plants with malpighian hairs; flowers commonly 12 mm long or less	<i>A. calycosus</i>
—	Wing tips entire; pubescence basifixed; flowers usually 15 mm long or more	20
20(19).	Plants strictly acaulescent, clothed below with a persistent thatch of leaf bases and stipules	21
—	Plants either not strictly acaulescent or the thatch not, or only poorly, developed	22
21(20).	Flowers ochroleucous, the keel purple-tipped; pods thinly long-pilose, the valves apparent through the pubescence	<i>A. eurekaensis</i>
—	Flowers pink-purple throughout; pods densely woolly-villous, the valves obscured by hairs	<i>A. newberryi</i>
22(20).	Leaves very densely hirsute-tomentose, with the longer hairs straight and spirally twisted; pods bilocular, densely woolly-hairy	<i>A. mollissimus</i>
—	Leaves variously pubescent, but if densely tomentose, the hairs all fine, sinous, and cottony, none straight and spirally twisted	23
23(22).	Pubescence of leaves, and commonly of entire plant, softly villous-tomentose, consisting of fine, cottony, contorted or entangled hairs; pods both villous-tomentose and hirsute	24
—	Pubescence of leaves various but not of extremely fine entangled hairs; pods merely strigose, or both villous-hirsute and tomentose	25
24(23).	Leaflets mostly obovate and obtuse; flowers bright pink-purple	<i>A. utahensis</i>
—	Leaflets various, but where the range of this and the preceding overlap (in Box Elder County), either elliptic or the petals whitish	<i>A. purshii</i>
25(23).	Pods hirsute and tomentose, the valves obscured by the long hairs; plants uncommon in northwestern Utah	<i>A. marianus</i>
—	Pods strigillose to strigose, the valves not obscured by the short hairs; plants common in northwestern Utah	<i>A. argophyllus</i>
26(18).	Plants subacaulescent; inflorescences with 1–4 pink-purple flowers, soon surpassed by the leaves; pods unilocular, 25–60 mm long, bladderly-inflated	<i>A. megacarpus</i>
—	Plants caulescent; inflorescences with 5 to many ochroleucous to pink-purple flowers, often surpassing the leaves; pods uni- or bilocular, often less than 25 mm long, or flowers not pink-purple, bladderly-inflated or not	27
27(26).	Stems arising from slender, rhizome-like caudex branches; flowers sessile in head-like racemes, erect or ascending; pods erect, long-pilose, less than 12 mm long	<i>A. agrestis</i>

- Stems arising from a woody caudex; flowers variously arranged, but if head-like then commonly spreading; pods various, but if erect then not long-pilose and often over 12 mm long 28
- 28(27). Pubescence of herbage consisting largely or entirely of malpighian hairs; pods erect, oblong-cylindric, fully bilocular; flowers ochroleucous; plants flowering in June and July *A. canadensis*
- Pubescence of herbage consisting of basifixed hairs; pods not as above; flowers variously colored; plants flowering in springtime 29
- 29(28). Stipules connate-sheathing, at least some 30
- Stipules all distinct 32
- 30(29). Stems and leaves long-hairy; plants with nodding white flowers; pods pendulous, stipitate, the body narrowly oblong, straight glabrous, bilocular *A. drummondii*
- Stems and leaves merely strigose; flowers ochroleucous; pods differing 31
- 31(30). Pods and ovaries glabrous, the body more than 12 mm long when mature, curved, trigonous, bilocular; plants of foothills and mountains, not with odor of selenium *A. scopulorum*
- Pods and ovaries usually strigose, the body often less than 12 mm long when mature, straight, bisulcate, unilocular; plants of low elevations in clay soils *A. bisulcatus*
- 32(29). Flowers small, the banner 12 mm long or less 33
- Flowers larger, the banner 12.5–28 mm long 34
- 33(32). Pods narrowly lanceolate to lance-elliptic in outline, never inflated, semi-bilocular; plants of western Box Elder Co. *A. iodanthus*
- Pods greatly inflated, bilocular; plants of various distribution *A. lentiginosus*
- 34(32). Flowers ochroleucous, or less commonly pink-purple; pods either bladdery-inflated or leathery and dorsiventrally compressed, borne on a stipe-like gynophore (a stalk of receptacular origin), usually jointed to the pod 35
- Flowers pink-purple or bicolored, not or seldom ochroleucous (except in *A. adanus*); pods bladdery inflated or not, sessile or nearly so 36
- 35(34). Pods bladdery-inflated, 1-loculed, commonly more than 30 mm long, the stipe (gynophore) more than 2 mm long in flower *A. oophorus*
- Pods leathery, subunilocular, never bladdery, dorsiventrally compressed, 15–30 mm long, the stipe (gynophore) 2 mm long or less in flower *A. beckwithii*
- 36(34). Flowers ochroleucous; stem and pods erect; plants rare in Utah *A. adanus*
- Flowers pink-purple or bicolored; pods usually spreading; plants common to abundant 37
- 37(36). Flowers usually bicolored, borne in compact racemes; pods oblong in outline, leathery, unilocular *A. cibarius*
- Flowers usually pink-purple, borne in short to elongate racemes; pods bladdery-inflated, membranous to papery, bilocular *A. lentiginosus*

KEY II

Plants of Beaver, Iron, Millard, Piute,
Sanpete, and Sevier counties

1. Plants mat-forming to erect, with leaflets all spinulose-tipped and decurrent along the rachis *A. kentrophyta*
- Plants various but not with both spinulose tips on leaflets and the leaflets all decurrent 2
- 2(1). Leaves simple, the blades oval to orbicular *A. asclepiadoides*
- Leaves plurifoliate, or if some simple then not as above 3
- 3(2). Plants rush-like or sprawling, the terminal leaflet confluent with the rachis and the upper leaves often simple 4
- Plants various, but seldom rush-like, the terminal leaflet jointed to the rachis and all leaves commonly plurifoliate 9
- 4(3). Flowers less than 10 mm long; stems arising from a slender subterranean, subrhizomatous caudex 5
- Flowers 15–20 mm long; stems arising from a superficial caudex 6
- 5(4). Pods bladdery-inflated; pubescence of malpighian hairs; stems usually sprawling *A. ceramicus*
- Pods narrowly oblong, not inflated; pubescence basifixed; stems erect *A. convallarius*
- 6(4). Flowers ochroleucous or very pale fresh pink 7
- Flowers pink-purple or bicolored 8
- 7(6). Racemes commonly shorter than the subtending leaves; calyx not brown; pods sessile, curved; plants in rounded clumps, not especially rush-like *A. tetrapteris*
- Racemes much longer than subtending leaves; calyx brown; pods long-stipitate, pendulous, straight; plants rush-like *A. lonchocarpus*
- 8(6). Uppermost leaves often simple; flowers bicolored; pods sessile, erect; plants of western Millard County *A. toanus*
- Uppermost leaves usually with tiny leaflets; flowers uniformly pink-purple; pods stipitate, pendulous; plants of Sevier Co. *A. coltonii*
- 9(3). Plants annual, usually growing in sand; pods bladdery-inflated *A. geyeri*
- Plants perennial, of various soils; pods various 10
- 10(9). Pubescence of herbage consisting largely or entirely of malpighian hairs 11
- Pubescence of herbage consisting of simple basifixed hairs 15
- 11(10). Plants acaulescent; stipules all distinct 12
- Plants caulescent; stipules connate, at least those at the lowermost nodes 13
- 12(11). Wing-tips deeply cleft apically; flowers usually bicolored, or varicolored in populations; pods bilocular, oblong *A. calycosus*
- Wing-tips entire; flowers ochroleucous suffused with purple; pods unilocular, obliquely ovoid; plants of eastern Sevier Co. *A. consobrinus*

- 13(11). Flowers yellowish; pods erect; plants erect, with odor of selenium *A. flavus*
 — Flowers pink-purple or ochroleucous; pods ascending; plants spreading, not
 with odor of selenium 14
- 14(13). Racemes 1- to 3-flowered; flowers pink-purple; leaflets 7-11; plants rare in
 Sanpete Co. *A. sesquiflorus*
 — Racemes 7- to many-flowered; flowers ochroleucous or suffused with dull
 purple; leaflets 11-17; plants of Beaver and Iron cos. *A. humistratus*
- 15(10). Flowers small, the banner 12 mm long or less 16
 — Flowers larger, the banner 12.5-20 mm long or more 29
- 16(15). Stipules all distinct, not even the lowermost connate 17
 — Stipules connate into a sheath, at least at the lowermost nodes 21
- 17(16). Flowers 5.5-8.5 mm long, bicolored; pods narrowly oblong, 3-angled, stipi-
 tate, the stipe 1.4-2 mm long *A. straturensis*
 — Flowers over 8.5 mm long, or if shorter then not bicolored; pods either
 bladdery-inflated or sessile, or both 18
- 18(17). Flowers dull purplish; pods oblong in outline; caudex usually subterranean
 *A. pinonis*
 — Flowers ochroleucous to pink-purple; pods bladdery-inflated; caudex super-
 ficial 19
- 19(18). Flowers very small, ochroleucous, the banner 5.2-8 mm long; pods di-
 aphanous, unilocular; plants of the Sevier Valley *A. wardii*
 — Flowers larger, or purplish, or the pods not especially diaphanous, or else bi-
 locular; plants of various distribution 20
- 20(19). Pods with a stipe 1-2.5 mm long, unilocular; flowers usually pink-purple;
 plants of plateaus in Iron and Piute cos. *A. serpens*
 — Pods sessile, bilocular; flowers ochroleucous tinged purplish; plants mainly of
 western Beaver and Iron cos. *A. lentiginosus*
- 21(16). Stipules turning black on drying; flowers ochroleucous; pods stipitate, the
 body strongly laterally flattened *A. tenellus*
 — Stipules not turning black on drying; flowers variously colored; pods stipitate
 or sessile, the body not as above 22
- 22(21). Plants subacaulescent, the internodes obscured by stipules and leaf bases 23
 — Plants short- to long-caulescent, the internodes apparent though sometimes
 short 25
- 23(22). Flowers ochroleucous; plants of lake shores and ridges in eastern Iron Co.
 *A. limocharis*
 — Flowers pink-purple; plants of ridge tops in western Beaver and Sanpete
 cos. 24
- 24(23). Leaflets glabrous above; pods unilocular; plants of Sanpete Co. *A. montii*
 — Leaflets strigose above; pods semibilocular; plants of western Beaver Co.
 *A. platytropis*
- 25(22). Plants erect or ascending; pods stipitate, pendulous 26

- Plants prostrate to decumbent or erect; pods short-stipitate to sessile, usually not pendulous 27
- 26(25). Flowers deflexed, numerous; plants with odor of selenium *A. bisulcatus*
- Flowers ascending to spreading; plants lacking odor of selenium *A. australis*
- 27(25). Plants high alpine dwarfs with bladdery-inflated pods; known from Tertiary igneous gravels in Piute Co. *A. perianus*
- Plants of high to low elevations, spreading, the pods oblong or merely turgid 28
- 28(27). Plants erect; keel with an elongate erect beak, pods oblong, not at all inflated *A. miser*
- Plants spreading-decumbent, keel-tip merely rounded; pods inflated *A. subcinereus*
- 29(15). Plants acaulescent or subacaulescent; herbage grayish or silvery-pubescent 30
- Plants caulescent (except subacaulescent in some *A. megacarpus*); herbage usually green 39
- 30(29). Plants strictly acaulescent; leaflets 3–11, or flowers 1–6 per raceme, or both; thatch of persistent leaf bases and stipules often obscuring the caudex branches 31
- Plants not strictly acaulescent, or if so then leaflets more than 11, or flowers more than 8, or both; thatch of persistent leaf bases and stipules poorly developed or lacking 33
- 31(30). Herbage pubescent with malpighian hairs (even though the attachment just above the base); flowers ochroleucous, tinged with purple, the keel purple-tipped; plants local in Piute and Sevier cos. *A. loanus*
- Herbage pubescent with basifixed hairs; flowers ochroleucous or pink-purple, the keel purple-tipped; plants more widely distributed 32
- 32(31). Petals commonly ochroleucous, sometimes faintly suffused with purple; valves of pod scarcely obscured by curly hairs *A. eurekensis*
- Petals pink-purple; valves of pod obscured by contorted underhairs *A. newberryi*
- 33(30). Herbage pubescent with malpighian hairs; pods strigose to strigillose; plants of Iron Co. *A. amphioxys*
- Herbage pubescent with basifixed hairs; pods variously pubescent; plants of broad or other distribution 34
- 34(33). Leaves very densely hirsute with the longer hairs spirally twisted; pods bilocular, densely long-hairy *A. mollissimus*
- Leaves variably pubescent, if densely tomentose, then the hairs all extremely fine, sinuous, and cottony, none straight and spirally twisted; pods unilocular, variously hairy 35
- 35(34). Pubescence of leaves (and commonly of entire plant) softly villous-tomentose, composed of extremely fine, cottony, or contorted and entangled hairs; pods both villous-tomentose and hirsute *A. utahensis*
- Pubescence of leaves various, composed either of straight, appressed or narrowly ascending hairs, or of spreading-incurved and sometimes sinuous and contorted hairs; pods strigulose, villous, or hirsute 36

- 36(35). Pods strigose to strigulose, the valves not obscured by the pubescence *A. argophyllus*
— Pods hirsute or tomentose or both, the valves usually obscured by the pubescence 37
- 37(36). Valves of pod hirsute with lustrous hairs, not obscured by the hairs; plants of sandy sites at low elevations in Millard Co. *A. callithrix*
— Valves of pods shaggy-hirsute and tomentose, almost or quite concealed by the hairs; plants of various distribution 38
- 38(37). Leaf pubescence appressed or nearly so; petals not very strongly graduated, the banner 17–21 and the keel 15–19 mm long; pods 20–35 mm long; ovules 27–36; plants widespread *A. marianus*
— Leaf pubescence mostly ascending; petals strongly graduated, the banner 18–22.5, the keel 12–13.5 mm long; pods to 12 mm long; ovules 14–16; plants local in Sanpete Co. *A. desereticus*
- 39(29). Plants subcaulescent; inflorescences with 1–4 pink-purple flowers, soon surpassed by the leaves; pods unilocular, 25–60 mm long, bladderly-inflated *A. megacarpus*
— Plants caulescent; inflorescences with 5-many ochroleucous to pink-purple flowers, often surpassing the leaves; pods uni- or bilocular, often less than 25 mm long, bladderly-inflated or not 40
- 40(39). Stems arising from slender, rhizome-like caudex branches; flowers subsessile, in head-like racemes, erect or ascending; pods erect, long-pilose, less than 12 mm long *A. agrestis*
— Stems arising from a woody caudex; flowers variously arranged, but if in head-like racemes then usually spreading; pods various but if erect then not long-pilose and often over 12 mm long 41
- 41(40). Stipules connate into a sheath, at least at the lowermost nodes (Note: go to couplet 29, Key I)
— Stipules all distinct 42
- 42(41). Plants odoriferous selenophytes of claysoils; flowers ochroleucous; pods leathery-woody, cylindric to ovoid, spreading to ascending 43
— Plants not with odor of selenium, of various soils; flowers ochroleucous, pink-purple, or bicolored; pods inflated, often bladderly and membranous, but if leathery then of different shape 44
- 43(42). Calyx ochroleucous or whitish, as pale as the petals; pods cylindric, steeply ascending; plants of eastern Sevier Co. *A. pattersonii*
— Calyx of somewhat different hue from the petals; pods normally spreading-ascending and ellipsoid or broadly cylindric; plants of western Sevier, Millard, Beaver, and Iron cos. *A. praelongus*
- 44(42). Pods and ovaries long-hairy, at maturity plumply ovoid; flowers ochroleucous, steeply ascending; plants introduced in Sanpete Co., but to be expected elsewhere *A. cicer*
— Pods and ovaries strigose to glabrous, at maturity variously shaped; flowers ochroleucous, pink-purple, or bicolored, seldom steeply ascending; plants indigenous and widespread 45

45(44). Flowers ochroleucous 46

— Flowers pink-purple or bicolored 47

46(45). Pods bladdery-inflated, unilocular, usually more than 30 mm long at maturity; stipe more than 2 mm long subequal to the calyx tube *A. oophorus*

— Pods leathery, subunilocular, never bladdery, dorsiventrally compressed, 15–30 mm long; stipe 2 mm long or less in flower *A. beckwithii*

47(45). Flowers bicolored, the wing-tips white, borne in subcapitate racemes; pods oblong, leathery, sessile *A. cibarius*

— Flowers pink-purple, borne in open racemes; pods various, but not as above 48

48(47). Pods and ovaries bilocular, sessile or nearly so; plants widespread and common *A. lentiginosus*

— Pods and ovaries subunilocular or unilocular, shortly to moderately stipitate; plants of rather restricted range in western Millard, Iron, and Beaver cos. 49

49(48). Pods bladdery-inflated, unilocular, usually more than 30 mm long; stipe subequal to the calyx tube; calyx tube more than 7 mm long *A. oophorus*

— Pods leathery, subunilocular, never bladdery, dorsiventrally compressed 15–30 mm long; stipe shorter than the calyx tube; calyx tube less than 7 mm long *A. beckwithii*

KEY III
Plants of Washington County

1. Plants rush-like or sprawling, the terminal leaflet confluent with the rachis, and the upper leaves often simple 2

— Plants various, but seldom rush-like, the terminal leaflet jointed to the rachis and all leaves plurifoliolate 5

2(1). Flowers more than 12 mm long, the petals ochroleucous or suffused with pale pink; pods curved, dorsiventrally compressed *A. tetrapteris*

— Flowers less than 12 mm long, the petals variously colored; pods neither curved nor dorsiventrally compressed 3

3(2). Pods and ovaries stipitate, at maturity bladdery-inflated; pubescence malpighian; stems from elongated rhizome-like caudex branches *A. ceramicus*

— Pods and ovaries sessile or subsessile, oblong in outline, not inflated; pubescence basifixed; stems from superficial to deep-seated caudex 4

4(3). Stipules connate into a sheath, at least at lowermost nodes; plants of northwestern Washington Co. *A. convallarius*

— Stipules all distinct; plants of eastern Washington Co. *A. lancearius*

5(1). Plants slender, diminutive annuals with tiny flowers and curved bilocular pods *A. nuttallianus*

— Plants perennial, and otherwise commonly differing from above 6

6(5). Pubescence of herbage consisting largely or entirely of malpighian hairs 7

— Pubescence of herbage consisting of basifixed hairs 11

- 7(6). Flowers pink-purple, more than 12 mm long; pods 20–30 mm long or more *A. amphioxys*
 — Flowers variously colored, but if pink-purple then usually less than 12 mm long or pods shorter than 12 mm long 8
- 8(7). Plants acaulescent; wing petals deeply cleft apically; pods bilocular *A. calycosus*
 — Plants with well-developed stems; wing petals entire apically; pods uni- or bilocular 9
- 9(8). Flowers ochroleucous, nodding at anthesis; pods erect, bilocular, oblong-cylindric *A. canadensis*
 — Flowers ochroleucous to pink-purple, ascending to anthesis; pods erect to spreading, variously shaped, unilocular 10
- 10(9). Stems prostrate-spreading; pods curved, not bisulcate ventrally; plants not with odor of selenium *A. humistratus*
 — Stems erect or ascending; pods straight, bisulcate ventrally; plants with odor of selenium *A. flavus*
- 11(6). Flowers small, the banner 12 mm long or less 12
 — Flowers larger, the banner 12.5–25 mm long or more 15
- 12(11). Flowers 6.5–8.5 mm long, bicolored; pods narrowly oblong, 3-angled, stipitate, the stipe 1.4–2 mm long *A. straturensis*
 — Flowers over 8.5 mm long, or if shorter then not bicolored; pods bladdery-inflated, sessile or subsessile 13
- 13(12). Plants subacaulescent, usually less than 5 cm tall; flowers 1–5; rare in sandy sites in eastern Washington Co. *A. striatiflorus*
 — Plants caulescent, usually over 20 cm tall; flowers numerous; plants of various habitats and distribution 14
- 14(13). Pods bilocular, diaphanous; lowermost stipules distinct *A. lentiginosus*
 — Pods unilocular, opaque and usually mottled; lowermost stipules shortly connate-sheathing *A. subcinereus*
- 15(11). Plants acaulescent or subacaulescent; herbage grayish or silvery hairy 16
 — Plants caulescent; herbage usually green 22
- 16(15). Plants strictly acaulescent, the caudex branches obscured by a thatch of persistent leaf bases; leaflets 11 or fewer *A. newberryi*
 — Plants subacaulescent, the caudex branches not obscured by a thatch of leaf bases; leaflets commonly more than 11 17
- 17(16). Leaflets more than 21 on at least some mature leaves; pods strigose or strigulose *A. tephrodes*
 — Leaflets fewer than 21 on all leaves, or the pods densely villous 18
- 18(17). Leaves very densely hirsute with the longer hairs spirally twisted; pods bilocular, densely long-hairy *A. mollissimus*
 — Leaves variably pubescent, if densely tomentose, the hairs all extremely fine, sinuous, and cottony, none straight and spirally twisted; pods unilocular, variously hairy 19

19(18). Pods densely long hairy 20

— Pods merely strigose or strigulose 21

20(19). Leaflets oval to orbicular, rounded apically, white cottony-hairy; calyx tube more than 4 mm wide (when pressed) *A. utahensis*

— Leaflets elliptic to obovate, obtuse or acute to rounded apically, silvery strigose; calyx tube less than 4 mm wide *A. marianus*

21(19). Leaflets mostly acute; pods brightly mottled; rocky ledges and talus of sandstone canyons and escarpments *A. zionis*

— Leaflets obtuse to acute; pods not mottled; plants mostly of humus in mountain brush and upwards *A. argophyllus*

22(15). Stipules connate-sheathing, at least at the lowermost nodes 23

— Stipules all distinct 24

23(22). Petals ochroleucous, the keel purple-tipped; pods pendulous, the body oblong-cylindric, bisulcate; plants with odor of selenium *A. bisulcatus*

— Petals pink-purple or ochroleucous; pods erect, the body ovoid, not bisulcate *A. ampullarius*

24(22). Plants odoriferous selenophytes, usually of clay soils; flowers ochroleucous or pink-purple with white wing-tips; pods oblong-cylindric, ascending or spreading 25

— Plants not odoriferous selenophytes, of various soils, flowers variously colored; pods various 26

25(24). Flowers bicolored; calyx suffused dark-purple; pods erect-ascending *A. preussii*

— Flowers ochroleucous; calyx greenish; pods ascending-spreading *A. praelongus*

26(24). Pods and ovaries stipitate, the stipe at maturity subequal to or surpassing the calyx 27

— Pods and ovaries sessile or nearly so 28

27(26). Stems decumbent to ascending; pods bladdery-inflated, unilocular, the body usually over 25 mm long; flowers ochroleucous or pink-purple *A. oophorus*

— Stems erect; pods not or only somewhat inflated, bilocular, the body usually less than 20 mm long; flowers ochroleucous or pink-purple *A. eremiticus*

28(26). Pods bladdery-inflated, ovoid or merely curved-oblong, bilocular, sessile; flowers variously colored, but not usually bicolored *A. lentiginosus*

— Pods not bladdery, oblong, usually curved, bi- or unilocular; flowers commonly bicolored 29

29(28). Flowers borne in subcapitate racemes; pods dorsiventrally compressed, unilocular *A. cibarius*

— Flowers borne in elongate racemes; pods laterally or trigonously compressed, bilocular *A. ensiformis*

KEY IV

Plants of Daggett, Duchesne, Rich, Summit,
Uintah, and Wasatch Counties

1. Plants mat-forming or erect, with leaflets all spinulose-tipped and decurrent

- along the rachis *A. kentrophyta*
- Plants various, but not with the leaflets both spinulose-tipped and decurrent on the rachis 2
- 2(1). Leaves simple, oval to orbicular; plants with odor of selenium *A. asclepiadoides*
- Leaves various, but if simple then linear to linear-oblongate; plants with or without odor of selenium 3
- 3(2). Leaves simple (rarely with leaflets on some leaves), the blades grass-like; plants acaulescent 4
- Leaves plurifoliate, or rarely trifoliate, or the uppermost only simple; if acaulescent never as above 5
- 4(3). Leaves not over 8 cm long; racemes with flowers usually fewer than 8, less than 3.5 cm long in fruit *A. spatulatus*
- Leaves usually more than 8 cm long; racemes with flowers usually more than 8, more than 4.5 cm long in fruit *A. chloodes*
- 5(3). Plants rush-like or sprawling, the terminal leaflet confluent with the rachis, and some of the upper leaves often simple (see also *A. duchensensis*) 6
- Plants various, but seldom rush-like, the terminal leaflet jointed to the rachis and all leaves plurifoliate (except in some *A. detritalis*, *A. aretioides* and *A. gilviflorus*) 10
- 6(5). Flowers 10 mm long or less; stems arising from a slender subterranean subrhizomatous caudex 7
- Flowers 15–20 mm long or more; stems arising from a superficial caudices 8
- 7(6). Pods bladder-inflated; pubescence of malpighian hairs; stems usually sprawling *A. ceramicus*
- Pods narrowly oblong, not inflated; pubescence of basifixed hairs; stems commonly erect *A. convallarius*
- 8(6). Flowers pink-purple; pods leathery-woody, laterally compressed; plants selenophytes of clays and silts, restricted to Uintah Co. *A. saurinus*
- Flowers ochroleucous to yellow; pods various, but not as above; plants selenophytes or not, from Uintah or Daggett cos. 9
- 9(8). Pods stipitate, pendulous; plants not with odor of selenium, usually 3.5 dm tall or more, known only from Uintah Co. *A. hamiltonii*
- Pods sessile or subsessile, ascending; plants seleniferous, less than 3.5 dm tall, known only from Daggett Co. *A. nelsonianus*
- 10(5). Plants annual, usually growing in sand; pods bladder-inflated *A. geyeri*
- Plants perennial, of various soils; pods various 11
- 11(10). Pubescence of herbage consisting largely or entirely of malpighian hairs 12
- Pubescence of herbage consisting of basifixed hairs 18
- 12(11). Plants acaulescent or subacaulescent, the herbage grayish or whitish pubescent 13
- Plants caulescent, the herbage commonly green 16

- 13(12). Flowers ochroleucous, borne sessile among the leaves; leaves trifoliolate; plants of Summit Co. *A. gilviflorus*
- Flowers pink-purple or pale and suffused with purple, pedunculate; leaves with 5 or more leaflets on at least some leaves; plants of Daggett, Duchesne, and Uintah cos. 14
- 14(13). Leaves with leaflets 3, silvery strigose; flowers 6–8 mm long; plants local in Daggett Co. *A. aretoides*
- Leaves simple or with 3–17 leaflets, strigose but not silvery; flowers 13–20 mm long or more; plants more widely distributed 15
- 15(14). Plants strictly acaulescent; leaflets narrowly oblong, spinulose-tipped; pods linear-oblong *A. detritalis*
- Plants subcaulescent; leaflets obovate, rounded to obtuse apically; pods ellipsoid *A. chamaeleuce*
- 16(13). Plants selenophytes, usually of clay soils; flowers yellowish; pods unilocular *A. flavus*
- Plants not selenophytes, of various soils; flowers ochroleucous or pink-purple; pods bilocular 17
- 17(16). Flowers pink-purple, erect or steeply ascending at anthesis; stems from a caudex; plants known from Daggett Co. *A. adsurgens*
- Flowers ochroleucous, nodding at anthesis; stems from creeping rhizomes *A. canadensis*
- 18(12). Flowers small, the banner 12 mm long or less 19
- Flowers larger, the banner 12.5–25 mm long or more 30
- 19(18). Stipules all distinct, not even the lowermost connate 20
- Stipules connate-sheathing, at least at the lowest nodes 24
- 20(19). Plants dwarf, arising from a deeply seated caudex and elongate rhizome-like branches; flowers ochroleucous; pods bladdery-inflated, strigose, unilocular; plants of Green River Shale, Uintah Co. *A. lutosus*
- Plants differing from above, the caudex superficial; flowers pink-purple or ochroleucous; pods various, but if bladdery-inflated then bilocular or spreading-hairy 21
- 21(20). Flowers ochroleucous, suffused faintly with purple; pods bladdery-inflated, strigose to glabrous; plants of Wasatch and Summit cos. *A. lentiginosus*
- Flowers pink-purple or bicolored; pods not inflated or if so then spreading-hairy; plants of Summit, Duchesne, and Uintah cos. 22
- 22(21). Calyx more than half as long as the petals; pods sessile, straight, spreading; plants of moderate elevations, north slope of Uinta Mountains *A. eucosmus*
- Calyx less than half as long as the petals; pods stipitate or sessile, straight and pendulous or spreading and curved; plants of low elevations in the Uinta Basin 23
- 23(22). Leaflets linear to narrowly oblong; calyx teeth broadly triangular, 1 mm long or less; pods pendulous, straight, strigose *A. duchesnensis*
- Leaflets oblanceolate to obovate; calyx teeth narrowly subulate, more than 2

	mm long; pods sessile, inflated, spreading, curved, long-pilose	<i>A. pubentissimus</i>
24(19).	Plants dwarf, less than 6 cm tall; caudex branches with a persistent thatch of marcescent stipules; flowers minute, 6.5 mm long or less; pods bladdery-inflated; known from Rich Co.	<i>A. jejunos</i>
—	Plants taller; caudex branches not as above; flowers commonly larger; pods not bladdery-inflated; distribution various	25
25(24).	Stipules turning black on drying; flowers ochroleucous; pods short-stipitate, strongly laterally flattened	<i>A. tenellus</i>
—	Stipules not turning black on drying; flowers pink-purple or ochroleucous; pods various, but if as above then flowers pink-purple	26
26(25).	Plants odoriferous selenophytes; flowers pink-purple or ochroleucous, the keel purple-tipped, numerous, nodding at anthesis; pods bisulcate ventrally	<i>A. bisulcatus</i>
—	Plants not smelling of selenium; flowers pink-purple or ochroleucous; pods not bisulcate ventrally	27
27(26).	Flowers ochroleucous; pods long-stipitate more than 20 mm long at maturity, laterally compressed but not flattened; plants known from Wasatch Co.	<i>A. australis</i>
—	Flowers pink-purple or if stipitate then less than 15 mm long and flattened laterally	28
28(27).	Pods and ovaries sessile or substipitate, the body flattened; plants known from Duchesne Co.	<i>A. wingatanus</i>
—	Pods and ovaries sessile or substipitate, the body various, but not strongly flattened; distribution various	29
29(28).	Plants with sprawling stems, usually of pinyon-juniper and desert shrublands; pods terete, mostly 12 mm long or less; rare in Uintah Co.	<i>A. flexuosus</i>
—	Plants with upright stems, usually of aspen or spruce-fir woodlands; pods laterally compressed, usually 15 mm longer more	<i>A. miser</i>
30(18).	Plants acaulescent or subacaulescent; herbage grayish or silvery hairy	31
—	Plants caulescent (subacaulescent in some <i>A. megacarpus</i>); herbage usually green	34
31(30).	Leaves very densely hirsute-tomentose, with the longer hairs straight and spirally twisted; pods bilocular, densely woolly-hairy	<i>A. mollissimus</i>
—	Leaves variously pubescent, but if densely tomentose, the hairs all fine, sinuous, and cottony, none straight and spirally twisted	32
32(31).	Pubescence of leaves various, but not of extremely fine entangled hairs; pods merely strigose	<i>A. argophyllus</i>
—	Pubescence of leaves softly villous-tomentose, consisting of fine, cottony, contorted or entangled hairs; pods both villous-tomentose and hirsute	33
33(32).	Leaflets mostly obovate and obtuse; flowers bright pink-purple	<i>A. utahensis</i>
—	Leaflets either elliptic and acute or petals ochroleucous	<i>A. purshii</i>
34(30).	Plants subacaulescent; flowers pink-purple, 1–5 per raceme; pods bladdery-	

inflated, unilocular, commonly over 30 mm long *A. megacarpus*

— Plants differing in one or more ways from above 35

35(34). Plants odoriferous selenophytes, usually of clay soils at lower elevations; flowers nodding at anthesis 36

— Plants not with odor of selenium, usually of loamy soils at moderate elevations 37

36(35). Pods and ovaries strigose, at maturity ventrally bisulcate, mostly less than 15 mm long *A. bisulcatus*

— Pods and ovaries glabrous, at maturity trigonous, not bisulcate, mostly over 15 mm long *A. racemosus*

37(35). Stems arising from slender, rhizome-like caudex branches; flowers subsessile in head-like racemes, erect or ascending; pods erect, long-pilose, less than 12 mm long *A. agrestis*

— Stems arising from a caudex; flowers variously arranged, but if in head-like racemes then spreading; pods not erect, usually more than 15 mm long 38

38(37). Flowers in compact, head-like racemes; petals bicolored; pods oblong, dorsiventrally compressed *A. cibarius*

— Flowers in elongate racemes, or if somewhat shortened then petals pink-purple or the pods bladdery-inflated 39

39(38). Flowers ochroleucous; pods stipitate, pendulous *A. scopulorum*

— Flowers pink-purple; pods sessile, spreading *A. lentiginosus*

KEY V

Plants of Carbon, Emery, and Wayne Counties

1. Plants mat-forming or erect, with leaflets all spinulose-tipped and decurrent along the rachis *A. kentrophyta*

— Plants various, but not with both leaflets spinulose-tipped and decurrent along the rachis 2

2(1). Leaves simple, oval to orbicular; plants with odor of selenium *A. asclepiadoides*

— Leaves usually plurifoliolate, at least some (simple in *A. spatulatus*); plant with or without odor of selenium 3

3(2). Leaves simple; plants pulvinate caespitose; plants of Emery Co. *A. spatulatus*

— Leaves plurifoliolate, at least some; plants of various distribution 4

4(3). Plants rush-like or sprawling, the terminal leaflet confluent with the rachis, some of the uppermost leaves sometimes simple 5

— Plants various, but not or seldom rush-like, the terminal leaflet jointed to the rachis and all leaves plurifoliolate (rarely the lowermost simple) 14

5(4). Pubescence of herbage consisting largely or entirely of malpighian hairs 6

— Pubescence of herbage consisting of basifixed hairs 7

6(5). Flowers 10 mm long or less; stems arising singly from elongate, rhizome-like

- caudex branches; pods bladdery-inflated, stipitate; plants not with odor of selenium *A. ceramicus*
- Flowers 15 mm long or more; stems arising several together from a subterranean caudex; pods laterally compressed, sessile; plants with odor of selenium *A. woodruffii*
- 7(5). Flowers 10 mm long or less 8
- Flowers 11–25 mm long or more 10
- 8(7). Flower numerous; calyx densely pilose; pods short, spreading-ascending *A. moencoppensis*
- Flowers 12 or fewer; calyx merely strigose; pods narrowly oblong, declined to pendulous 9
- 9(8). Pods and ovaries stipitate; flowers bright pink-purple; plants of sandy washes; known only from Capitol Reef National Park *A. harrisonii*
- Pods and ovaries sessile; flowers dull purplish; plants of different distribution *A. convallarius*
- 10(7). Flowers ochroleucous; calyx brown; pods stipitate, pendulous; plants often over 50 cm tall *A. lonchocarpus*
- Flowers pink to pink-purple; calyx often cyaneus, not brown; pods various, usually sessile, or if stipitate then less than 40 cm tall 11
- 11(10). Plants tall selenophytes; flowers 20 mm long or more; plants of clay or silt in San Rafael Swell *A. rafaensis*
- Plants not with odor of selenium; flowers 17 mm long or less; plants of various soils and distribution 12
- 12(11). Pods and ovaries sessile or nearly so; petals pale pink or tinged with purple; plants of San Rafael Swell and southward *A. episcopus*
- Pods and ovaries stipitate, at maturity the stipe 3–6 mm long or more; petals mostly bright pink-purple; plants usually west or east of the San Rafael Swell proper 13
- 13(12). Caudex superficial; flowers spreading to declined at anthesis; plants mostly west of the San Rafael Swell proper *A. coltonii*
- Caudex subterranean; flowers ascending at anthesis; plants east of the San Rafael Swell proper *A. nidularius*
- 14(4). Plants definitely annual; flowers usually less than 8 mm long; pods bladdery-inflated and unilocular, or curved-oblong and bilocular 15
- Plants perennial, though sometimes flowering the first year, but the flowers then mostly over 8 mm long; pods various 16
- 15(14). Pods bladdery-inflated unilocular; stems and peduncles often 1 mm wide or more *A. geyeri*
- Pods curved-oblong, bilocular; stems and peduncles filiform, mostly less than 1 mm thick *A. nuttallianus*
- 16(14). Herbage pubescent largely or entirely with malpighian hairs 17
- Herbage pubescent with basifixed hairs 25
- 17(16). Plants caulescent; pods short, ascending; stipules connate, at least the lower-

most 18

— Plants acaulescent or subacaulescent, not smelling or selenium; pods various; stipules all distinct 19

18(17). Plants odoriferous selenophytes, of low elevations, pods unilocular *A. flavus*

— Plants not smelling of selenium, of moderate to high elevations; pods bilocular *A. adsurgens*

19(17). Wing tips deeply cleft apically; flowers usually bicolored or varicolored in populations; pods bilocular, oblong *A. calycosus*

— Wingtips entire; flowers various in color; pods unilocular, variously shaped 20

20(19). Leaflets (1) 3–5 (rarely more in *A. loanus*); plants strictly acaulescent, the caudex branches obscured by a thatch of persistent leaf bases; pods spreading-hairy 21

— Leaflets mostly more than 5, at least on some leaves; plants various, but if strictly acaulescent the thatch poorly or not developed; pods strigose 22

21(20). Leaflets 1–3 on most leaves; flowers pink-purple; pods with hairs to 2 mm long; plants rather widespread in the region *A. musiniensis*

— Leaflets usually 5 on most leaves; flowers ochroleucous or tinged purplish; pods with hair 2–2.5 mm long; plants of western Wayne Co. *A. loanus*

22(20). Flowers ochroleucous, tinged purplish, 11–12.5 mm long; pods laterally compressed only near the apex; plants of western Emery and Wayne cos. *A. consobrinus*

— Flowers pink-purple or bicolored, mostly 15–25 mm long; pods laterally compressed throughout or dorsiventrally so 23

23(22). Pods laterally compressed, straight; persistent; flowers often pale or dull purplish; common in the vicinity of the San Rafael Swell *A. cymboides*

— Pods dorsiventrally compressed, usually curved, deciduous; flowers pink-purple or bicolored; common to uncommon in the region 24

24(23). Flower usually bicolored; walls of pod at least 1 mm thick, the endocarp and exocarp separated by a thick mesocarp; plants rare in the region *A. chamaeleuce*

— Flowers usually bright pink-purple; walls of pod less than 1 mm thick, becoming leathery when ripe; plants common *A. amphioxys*

25(16). Flowers small, the banner 12 mm long or less 26

— Flowers larger, the banner 12.5–15 mm long or more 39

26(25). Stipules all distinct, not even the lowermost connate 27

— Stipules connate-sheathing at least at the lowermost nodes 32

27(26). Flowers 5 mm long or less, 2–5, born on linear-filiform peduncles; plants sprawling, usually of volcanic gravels *A. brandegei*

— Flowers commonly 7 mm long or more, usually more than 5, borne on substantial peduncles; plants ascending to erect, never really sprawling, seldom, if ever, of volcanic soils 28

28(27). Plants subacaulescent, the stems shorter than the inflorescence; stipules

- prominent *A. desperatus*
- Plants caulescent, the stems longer than the inflorescence; stipules hardly prominent 29
- 29(28). Pods strongly mottled, bladdery-inflated, merely strigose; plants known from western Wayne Co. *A. serpens*
- Pods not or slightly mottled, inflated but hardly bladdery; villous with spreading hairs; plants mostly along the sandy eastern portion of the region 30
- 30(29). Racemes with 10 or more flowers; plants rare in the region *A. pubentissimus*
- Racemes with 10 or fewer flowers; plants rare to locally common 31
- 31(30). Pods 5–8 mm in diameter, curved-oblong; ovules 10–19; plants rare in the region *A. sabulorum*
- Pods 8–11 mm in diameter, ovoid-ellipsoid; ovules 20–28; plants locally common *A. pardalinus*
- 32(26). Stipules turning black on drying; flowers ochroleucous; pods short-stipitate, strongly laterally flattened; plants of the high plateau sections *A. tenellus*
- Stipules not turning black on drying; flowers various; pods various, but if as above then flowers pink-purple or plants of low elevations 33
- 33(32). Stems shorter than the inflorescences; flowers pink-purple, numerous; pods erect; sessile *A. moencoppensis*
- Stems longer than the inflorescences, or if shorter than the flowers 10 or fewer per raceme; pods seldom erect 34
- 34(33). Plants odoriferous selenophytes; flowers ochroleucous, numerous, nodding at anthesis; pods bisulcate ventrally *A. bisulcatus*
- Plants not smelling of selenium; flowers pink-purple or sometimes ochroleucous, ascending at anthesis; pods not bisulcate ventrally 35
- 35(34). Pods and ovaries stipitate, the body flattened or triquetrous 36
- Pods and ovaries sessile or subsessile, the body various but not strongly flattened 37
- 36(35). Pods not strongly compressed; wing petals bilobed; plants of high elevation in Emery Co. *A. australis*
- Pods strongly compressed; wing petals entire; plants of lower elevations in Carbon and Emery cos. *A. wingatanus*
- 37(35). Plants with elongate clambering stems, known from moist meadows in western Wayne Co. *A. bodinii*
- Plants with short to elongate, erect to sprawling stems of different distribution or habitat 38
- 38(37). Plants with sprawling stems, commonly of pinyon-juniper and desert shrublands; pods mostly 15 mm long or less; known from lower elevations Carbon and Emery cos. *A. flexuosus*
- Plants with upright stems, usually of aspen or spruce-fir woodlands; pods laterally compressed, usually 15 mm long or more *A. miser*
- 39(26). Plants acaulescent or subacaulescent; herbage grayish- or silvery-hairy 40

- Plants caulescent (subacaulescent in *A. megacarpus*); herbage usually green 43
- 40(39). Herbage merely strigose; flowers 13–15 mm long; stipules prominent; pods hirsute *A. barnebyi*
- Herbage tomentose to strigose; flowers 15–25 mm long; stipules not prominent; pods variously pubescent 41
- 41(40). Leaves very densely hirsute-tomentose, with the longer hairs straight and spirally twisted; pods bilocular, densely woolly-hairy *A. mollissimus*
- Leaves variously pubescent, but if densely tomentose, the hairs all fine, sinuous, and cottony, none straight and spirally twisted 42
- 42(41). Pubescence of leaves softly villous-tomentose, consisting of fine, cottony, contorted or entangled hairs; pods both villous-tomentose and hirsute *A. utahensis*
- Pubescence of leaves strigose, not of fine entangled hairs; pods strigose *A. argophyllus*
- 43(39). Plants subacaulescent; flowers pink-purple, 1–5 per raceme; pods bladdery-inflated, unilocular, often more than 30 mm long *A. megacarpus*
- Plants differing in one or more ways from above 44
- 44(43). Plants odoriferous selenophytes, usually of clay soils at low elevations; flowers ochroleucous and nodding or the calyx purple and flowers ascending 45
- Plants not smelling of selenium, of various soil types and elevations; flowers not with either of the combinations noted above 48
- 45(44). Flowers ochroleucous, nodding at anthesis; calyx whitish, cream-colored or greenish; pods woody 46
- Flowers pink-purple or bicolored, ascending at anthesis; calyx purple; pods leathery 47
- 46(45). Calyx and petals concolorous both whitish to cream-colored; pods cylindric, sessile, steeply ascending; plants of Carbon Co. *A. pattersonii*
- Calyx and petals discolorous, the calyx often greenish, the petals ochroleucous; pods spreading ascending or if steeply ascending, then stipitate *A. praelongus*
- 47(45). Pods horizontally spreading or declined, borne on ascending to reclining peduncles; stems seldom more than 10 cm long; plants rare *A. eastwoodae*
- Pods erect or steeply ascending, borne on erect peduncles; stems mostly much longer than 10 cm long; plants common *A. preussii*
- 48(44). Stems arising from slender, rhizome-like caudex branches; flowers subsessile in head-like racemes, erect or ascending; pods erect, long-pilose, less than 12 mm long *A. agrestis*
- Stems arising from a caudex; flowers variously arranged, but not or rarely head-like, spreading at anthesis; pods not as above 49
- 49(48). Flowers pink to pink-purple; pods sessile, bilocular *A. lentiginosus*
- Flowers ochroleucous; pods stipitate, uni- or bilocular 50
- 50(49). Stipules connate-sheathing at least some; pods bilocular, triquetrous, 3–5 mm wide *A. scopulorum*

- Stipules all distinct; pods unilocular, bladdery-inflated, 10-30 mm wide *A. oophorus*

KEY VI
Plants of Grand and San Juan Counties

- 1. Leaves simple, oval to orbicular; plants with odor of selenium *A. asclepiadoides*
- Leaves usually plurifoliate (simple in *A. spatulatus*); plants with or without the odor of selenium 2
- 2(1). Leaves simple; plant pulvinate-caespitose, of Grand Co. *A. spatulatus*
- Leaves usually plurifoliate; plant seldom as above, of various distribution 3
- 3(2). Plants rush-like or sprawling, the terminal leaflet of at least uppermost leaves confluent with the rachis, some of the uppermost leaves often simple 4
- Plants various but seldom rush-like, the terminal leaflet jointed to the rachis in all leaves, and all leaves plurifoliate (rarely the lowermost simple) 8
- 4(3). Pubescence of herbage consisting of basifixed hairs; pods not bladdery-inflated *A. ceramicus*
- Pubescence of herbage consisting of basifixed hairs; pods not bladdery-inflated 5
- 5(4). Flowers 10 mm long or less 6
- Flowers 12 mm long or more 7
- 6(5). Stems shorter than the inflorescence; flowers numerous, pink-purple; pods spreading-ascending *A. moencoppensis*
- Stems longer than the inflorescences; flowers usually 15 or fewer, dull pink-purple; pods spreading-pendulous *A. convallarius*
- 7(5). Flowers ochroleucous; calyx brown; plants commonly 50 cm tall or more *A. lonchocarpus*
- Flowers pink-purple; calyx greenish or blackish; plants commonly less than 45 cm tall, local in White Canyon, San Juan Co. *A. nidularius*
- 8(3). Plants definitely annual (see also *A. sabulonum*); flowers usually less than 8 mm long; pods bladdery-inflated and unilocular, or curved-oblong and bilocular 9
- Plants perennial, though sometimes flowering the first year, but the flowers then mostly more than 8 mm long; pods various 10
- 9(8). Pods bladdery-inflated, unilocular; stems and peduncles often 1 mm thick or more *A. geyeri*
- Pods curved-oblong, bilocular or nearly so; stems and peduncles filiform, mostly less than 1 mm thick *A. nuttallianus*
- 10(8). Herbage pubescent largely or entirely with malpighian hairs 11
- Herbage pubescent with basifixed hairs 18
- 11(10). Plants caulescent selenophytes; pods erect, less than 12 mm long *A. flavus*
- Plants acaulescent or subacaulescent, not smelling of selenium; pods various 12

12(11).	Stems diffuse and prostrate, sometimes matted; racemes 1- to 3-flowered	<i>A. sesquiflorus</i>
—	Stems various, but not as above; racemes commonly with more than 3 flowers	13
13(12).	Plants strictly acaulescent; flowers less than 12 mm long, or leaflets 5 or fewer, or both	14
—	Plants subacaulescent; flowers various; leaflets 5 or more on at least some leaves	15
14(13).	Flowers 12 mm long or less; wing petals bilobed apically; pods bilocular	<i>A. calycosus</i>
—	Flowers 18–25 mm long; wing petals entire apically; pods unilocular	<i>A. musiniensis</i>
15(13).	Pods narrowly oblong to oblong-ellipsoid, straight, laterally compressed when ripe	<i>A. cymboides</i>
—	Pods obliquely ovoid to ellipsoid, mostly curved, if straight then dorsally compressed	16
16(15).	Walls of pod at least 1 mm thick, the exocarp and endocarp separated by a thick mesocarp; petals mostly bicolored	<i>A. chamaeleuce</i>
—	Walls of pod much less than 1 mm thick, becoming leathery when ripe; petals pink-purple or bicolored	17
17(16).	Pods persistent or tardily deciduous, mostly lance ovoid in outline; plants rare	<i>A. missouriensis</i>
—	Pods readily deciduous, ellipsoid in outline; plants common	<i>A. amphioxys</i>
18(10).	Flowers small, the banner 12 mm long or less	19
—	Flowers larger, the banner 12.5–25 mm long or more	32
19(18).	Stipules all distinct, not even the lowermost connate	20
—	Stipules connate-sheathing at least at the lowermost nodes	25
20(19).	Plants subacaulescent, the stems shorter than the inflorescences; stipules prominent	21
—	Plants caulescent, the stems longer than the inflorescences; stipules inconspicuous	22
21(20).	Pods spreading hairy, unilocular, dorsally compressed; plants wide-spread	<i>A. desperatus</i>
—	Pods strigose, bilocular, laterally compressed; plants of the Cedar Mesa Sandstone, San Juan Co.	<i>A. monumentalis</i>
22(20).	Stems arising from elongate rhizome-like caudex branches; pods narrowly oblong, pendulous; plants of Cutler formation, Comb Wash, San Juan Co.	<i>A. cronquistii</i>
—	Stems from a superficial caudex; pods ovoid to ellipsoid, mostly spreading; plants of various distribution	23
23(22).	Petals whitish, with pink veins; pods ovoid-acuminate, strongly beaked, strigose; plants of Colorado River Canyon east from Moab	<i>A. wetherillii</i>

- Petals pink-purple or less commonly ochroleucous; pods ellipsoid, to ovoid-ellipsoid, spreading hairy; plants of various distribution 24
- 24(23). Flowers 8.8–11.7 mm long, commonly more than 10 per raceme; pods mostly more than 8 mm in diameter; plants of the Tavaputs escarpment *A. pubentissimus*
- Flowers 5.8–8.2 mm long, commonly fewer than 10 per raceme; pods less than 8 mm in diameter; plants of San Juan Co. *A. sabulonum*
- 25(19). Stipules turning black on drying; flowers ochroleucous; pods short-stipitate; strongly laterally flattened *A. tenellus*
- Stipules not blackening on drying; flowers various; pods various; but if as above then flowers pink-purple 26
- 26(25). Stems shorter than the inflorescences; flowers pink-purple, numerous; pods erect, sessile *A. moencoppensis*
- Stems longer than the inflorescences or if shorter, then the flowers 10 or fewer per raceme; pods seldom erect 27
- 27(26). Plants odoriferous selenophytes; flowers ochroleucous, numerous, nodding at anthesis; pods bisulcate ventrally *A. bisulcatus*
- Plants not smelling of selenium; flowers pink-purple or sometimes ochroleucous, ascending at anthesis; pods not bisulcate ventrally 28
- 28(27). Pods sessile or subsessile, the body oblong 29
- Pods stipitate, or the body bladdery-inflated 30
- 29(28). Plants with sprawling or slender and erect stems; pods mostly less than 18 mm long, subterete; mostly of mountain brush and pinyon-juniper communities *A. flexuosus*
- Plants with erect stems; pods laterally compressed usually 19 mm long or more; mostly in aspen or spruce-fir communities *A. miser*
- 30(28). Flowers 8 mm long or less; pods strongly laterally flattened; plants mostly in pinyon-juniper woodlands *A. wingatanus*
- Flowers 8.5–11.5 mm long; pods various, but not as above; plants of various habitats 31
- 31(30). Herbage fresh green; racemes usually with fewer than 10 flowers; pods narrowly oblong, not inflated; plants of the Tavaputs Plateau, Grand Co. *A. alpinus*
- Herbage often cinereous; racemes with more than 10 flowers; pods bladdery-inflated; plants of lower elevations in San Juan Co. *A. fucatus*
- 32(18). Plants acaulescent or subacaulescent; herbage often grayish- or silvery-hairy 33
- Plants caulescent; herbage often green 36
- 33(32). Flowers 15 mm long or less; pods merely strigose, linear-oblong; plants of sandstone formations; San Juan Co. *A. cottamii*
- Flowers more than 15 mm long; pods variously pubescent, ovoid-ellipsoid to ellipsoid; plants of various habitats and distributions 34
- 34(33). Leaflets mostly 17 or more per leaf, densely hirsute-tomentose, with longer hairs straight and spirally twisted; pods bilocular, densely woolly-

- hairy *A. mollissimus*
- Leaflets mostly 15 or fewer, mostly strigose; pods unilocular 35
- 35(34). Leaflets mostly acute; pods brightly mottled; rocky ledges and talus of sandstone canyons and escarpments *A. zionis*
- Leaflets obtuse to acute; pods not mottled; plants mostly of humus in mountain brush and upwards *A. argophyllus*
- 36(32). Plants odoriferous selenophytes, usually of clay soils 37
- Plants not smelling of selenium, usually not of clay soils 43
- 37(36). Stipules connate into a bidentate sheath, at least at the lowermost nodes; flowers pink-purple, declined at anthesis; pods stipitate, pendulous, bisulcate *A. bisulcatus*
- Stipules all distinct, even at the lowermost nodes; flowers variously colored, but if declined at anthesis then ochroleucous; pods sessile or stipitate, ascending to spreading, not bisulcate 38
- 38(37). Calyx tube purple; petals pink-purple or bicolored; pods leathery-inflated 39
- Calyx tube green to whitish, not purplish; petal ochroleucous to whitish 40
- 39(38). Pods horizontally spreading or declined, borne on ascending to reclining peduncles; stems seldom more than 10 cm long; plants rare *A. eastwoodae*
- Pods erect or steeply ascending, borne on erect peduncles; stems mostly much longer than 10 cm; plants locally common *A. preussii*
- 40(38). Flowers declined at anthesis; pods ascending to erect, 9 mm in diameter or less, leathery-woody in texture 41
- Flowers spreading to ascending; pods spreading to declined, usually over 10 mm in diameter, leathery in texture 42
- 41(40). Calyx and petals concolorous, both whitish to cream-colored; pods cylindric, sessile, steeply ascending; plants not definitely known from the region but nearby in Colorado *A. pattersonii*
- Calyx and petals discolorous, the calyx greenish, the petals ochroleucous; pods spreading-ascending or if steeply ascending then stipitate; plants common in the region *A. praelongus*
- 42(40). Flowers 17–18 mm long, the petals whitish; calyx tube 5.5–6.3 mm long; plants of Paradox and Morrison formations; La Sal Mts. *A. isleyi*
- Flowers 28–31 mm long, the petals ochroleucous; calyx tube 11.5–14 mm long; plants of the Mancos Shale formation, north of the Colorado River *A. sabulosus*
- 43(36). Stems arising from slender, rhizome-like caudex branches; flowers subsessile in head-like racemes, erect or ascending; pods erect, long-pilose, less than 12 mm long *A. agrestis*
- Stems arising from a caudex; flowers variously arranged, but seldom head-like and ascending to spreading; pods more than 12 mm long, spreading to pendulous 44
- 44(43). Pods and ovaries sessile, spreading, either bladdery-inflated or curved oblong to straight, bilocular 45
- Pods and ovaries stipitate, descending to pendulous, not much inflated or

- curved, uni- or bilocular 46
- 45(44). Pods trigonous, the sides flattened, straight, 3-5 mm thick; plants rare or extinct in Glen Canyon *A. bryantii*
- Pods terete or dorsiventrally compressed to inflated, usually over 5 mm thick; plants common *A. lentiginosus*
- 46(44). Flowers ochroleucous; pods bilocular; plants fresh green *A. scopulorum*
- Flowers pink-purple; pods unilocular; plants more or less cinereous *A. coltonii*

KEY VII

Plants of Garfield and Kane Counties

1. Plants mat-forming or erect, with leaflets all spinulose-tipped and decurrent along the rachis *A. kentrophyta*
- Plants various, but not with leaflets both spinulose-tipped and decurrent along the rachis 2
- 2(1). Leaves simple, oval to orbicular; plants with odor of selenium *A. asclepiadoides*
- Leaves usually plurifoliate, at least some; plants with or without the odor of selenium 3
- 3(2). Plants annuals (see also *A. subulonium*); flowers commonly less than 8 mm long; pods curved-oblong and bilocular or bladdery-inflated and ovoid 4
- Plants perennial, though sometimes flowering the first year, and then differing in one or more respects from above 6
- 4(3). Pods bladdery-inflated, unilocular; plants of eastern Garfield Co. *A. geyeri*
- Pods curved oblong, bilocular; plants of Kane and Garfield cos. 5
- 5(4). Keel tips rounded; leaflets all truncate-retuse on all leaves; pods deciduous, dehiscent at both ends after falling *A. emoryanus*
- Keel tips pointed; leaflets not truncate-retuse on all leaves; pods persistent, dehiscent at tip only *A. nuttallianus*
- 6(3). Plants with terminal leaflets confluent with the rachis, the uppermost leaves sometimes simple 7
- Plants with terminal leaflets jointed to the rachis, the leaves all plurifoliate (or the lowermost simple) 16
- 7(6). Pubescence of herbage consisting largely or entirely of malpighian hairs 8
- Pubescence of herbage consisting of basifixed hairs 9
- 8(7). Flowers 10 mm long or less; stems arising singly from elongate, rhizome-like caudex branches; pods bladdery-inflated, stipitate *A. ceramicus*
- Flowers 15 mm long or more; stem arising several together from a subterranean caudex; pods laterally compressed sessile *A. woodruffii*
- 9(7). Flowers ochroleucous, or whitish tinged with pink, 15 mm long or more 10

— Flowers pink-purple bicolored, or pale, 12 mm long or less 11

10(9). Inflorescences usually shorter than the subtending leaves; calyx not brown; pods sessile, curved; plants clump-forming not slender and tall, of western Kane Co. *A. tetrapetrus*

— Inflorescence much longer than the subtending leaves; calyx brown; pods long-stipitate, pendulous, straight; plants tall and slender, wide-spread *A. lonchocarpus*

11(9). Stems shorter than the inflorescences; flowers numerous; calyx densely pilose; pods short, spreading-ascending *A. moencoppensis*

— Stems shorter or longer than the inflorescences; flowers few to numerous; calyx merely strigose; pods various but not as above 12

12(11). Flowers dull pink-purple, usually 10 mm long or less; pods narrowly oblong, sessile, the body 4 mm wide or less *A. convallarius*

— Flowers pale to bright pink-purple, usually over 10 mm long, or pods more than 5 mm wide 13

13(12). Pods and ovaries sessile; petals pale; plants west and south of the Henry Mountains 14

— Pods and ovaries stipitate, at maturity the stipe 3–6 mm long or more; plants west or east of those mountains 15

14(13). Calyx short-cylindric, the tube longer than broad, suffused purplish or very pale, white-strigose; ovules 16–26 *A. episcopus*

— Calyx campanulate, the tube about as long as broad, not purplish, black-strigose; ovules 8–14 *A. lancearius*

15(13). Caudex superficial; flowers spreading or declined at anthesis; plants west of the Henry Mountains *A. coltonii*

— Caudex subterranean; flowers ascending at anthesis; plants east of the Henry Mountains *A. nidularius*

16(6). Herbage pubescent, largely or entirely, with malpighian hairs 17

— Herbage pubescent with basifixed hairs 25

17(16). Plants caulescent; pods short, ascending 18

— Plants acaulescent or subacaulescent; pods various 20

18(17). Plants erect or descending; flowers mostly more than 12 mm long; odoriferous selenophytes *A. flavus*

— Plants prostrate-spreading; flowers less than 12 mm long; not smelling of selenium 19

19(18). Racemes 1- to 3-flowered; flowers pink-purple; leaflets 7–11 plants of sandstone escarpments and ledges, mostly at lower elevations *A. sesquiflorus*

— Racemes 7- to many-flowered; flowers dull purplish; leaflets 11–17; plants mostly of higher plateaus *A. humistratus*

20(17). Plants subacaulescent, with one or more internodes usually apparent; caudex branches only rarely with persistent leaf bases 21

— Plants strictly acaulescent, the caudex branches usually with a per-

- sistent thatch of leaf bases 22
- 21(20). Flowers usually bicolored; walls of pod at least 1 mm thick, the exocarp and endocarp separated by a thick mesocarp; plants rare in the region *A. chamaeleuce*
- Flowers usually bright pink-purple; walls of pod less than 1 mm thick, becoming leathery when ripe; plants common *A. amphioxys*
- 22(20). Flowers mostly less than 12.5 mm long; pods less than 17 mm long 23
- Flowers more than 15 mm long; pods more than 20 mm long 24
- 23(22). Flowers pink to pink-purple, or bicolored, or ochroleucous, the wing petals emarginate apically; pods linear-oblong, bilocular *A. calycosus*
- Flowers ochroleucous, the wing petals entire apically; pods ovoid-ellipsoid, unilocular *A. consobrinus*
- 24(22). Leaflets 1-3 on most leaves; flowers pink-purple; pods with hairs to 2 mm long; plants mostly east of the high plateaus *A. musiniensis*
- Leaflets 5 on most leaves; flowers ochroleucous or tinged purplish; pods with hairs 2-2.5 mm long; plants of western Garfield Co. *A. loanus*
- 25(16). Flowers small, the banner 12 mm long or less 26
- Flowers larger, the banner 12.5-25 mm long or more 40
- 26(25). Flowers 6 mm long or less; pods unilocular, borne on slender peduncles, resupinate; stems sprawling; plants usually of volcanic gravels *A. brandegei*
- Flowers over 6 mm long, and the plants differing in other ways, usually not of volcanic gravels (or seldom so) 27
- 27(26). Plants with stipules all distinct, not even the lowermost connate 28
- Plants with stipules connate-sheathing, at least the lowermost 33
- 28(27). Plants subacaulescent; stipules prominent; stems shorter than the inflorescences 29
- Plants caulescent; stipules not conspicuous; stems longer than the inflorescences 30
- 29(28). Pods spreading-hairy unilocular, dorsally compressed; plants widespread along canyons of the Colorado *A. desperatus*
- Pods strigose, bilocular, laterally compressed; plants of Cedar Mesa Sandstone, eastern Garfield Co. *A. monumentalis*
- 30(28). Pods bladdery-inflated, diaphanous, strigose to glabrous; plants of moderate to high elevations in western Kane and western to eastern Garfield cos. 31
- Pods only moderately inflated, opaque, spreading-hairy; plants of low elevations in eastern portions of Kane and Garfield cos. 32
- 31(30). Flowers ochroleucous; pods sessile, glabrous, or nearly so, usually not mottled *A. wardii*
- Flowers pink-purple; pods strigose, short-stipitate, strongly mottled *A. serpens*
- 32(30). Pods 5-8 mm in diameter, curved-oblong; ovules 10-19; plants of eastern Kane Co. *A. sabulorum*
- Pods 8-11 mm in diameter, ovoid-ellipsoid; ovules 20-28; plants of eastern

- Garfield Co. *A. pardalinus*
- 33(27). Plants subacaulescent, the stems shorter than inflorescences; pods bladdery-inflated; growing in sand, on beaches, or volcanic gravels 34
- Plants caulescent, the stems shorter or longer than the inflorescences, when shorter, the pods not inflated; growing in various soil types and habitats 36
- 34(33). Flowers ochroleucous; plants of beaches in western Kane Co.
..... *A. limnocharis*
- Flowers pink-purple to whitish; plants of sandy sites at low elevations or of volcanic gravels at high elevations 35
- 35(34). Flowers 8–9 mm long, the banner not strongly veined; plants of volcanic gravels at high elevations in western Garfield Co. *A. perianus*
- Flowers 10–12 mm long, the banner strongly veined; plants of sandy sites at low elevations in Kane Co. *A. striatiflorus*
- 36(34). Stipules turning black on drying; flowers ochroleucous; pods short-stipitate, strongly laterally flattened *A. tenellus*
- Stipules not blackening on drying; flowers various; pods various, but not as above 37
- 37(36). Stems shorter than the inflorescences; flowers pink-purple; numerous, calyx densely villous; pods spreading-ascending, sessile *A. moencoppensis*
- Stems longer than the inflorescences, or if shorter, the flowers 10 or fewer, or the pods not spreading-ascending; calyx merely strigose 38
- 38(37). Pods oblong, not inflated; plants of aspen and spruce-fir communities at higher elevations *A. miser*
- Pods inflated to bladdery-inflated; plants commonly of ponderosa pine, pin-yon-juniper, or desert shrub communities at moderate to lower elevations 39
- 39(38). Calyces and stems silvery-caulescent, the hairs appressed; pod bladdery-inflated, more than 12 mm in diameter; ovules 21–32; plants of sandy sites at low elevations in eastern Garfield Co. *A. fucatus*
- Calyces and stems not silvery-caulescent, the hairs spreading; pods moderately inflated less than 13 mm in diameter; ovules 10–20; plants of moderate elevations in Kane and Garfield cos. *A. subcinereus*
- 40(25). Plants acaulescent or subacaulescent; herbage often grayish or silvery-hairy ...
..... 41
- Plants caulescent; herbage often green 48
- 41(40). Flowers 15 mm long or less, pink-purple; pods curved, 10–12 mm long, densely spreading-hairy; plants rare and local, Garfield Co. *A. barnebyi*
- Flowers more than 15 mm long; pods curved or straight, more than 12 mm long, variously hairy; plants of various distribution 42
- 42(41). Plants strictly acaulescent; caudex branches with a thatch of persistent stipules 43
- Plants subacaulescent; caudex branches with thatch poorly developed or lacking 45
- 43(42). Flowers ochroleucous, 15–23 mm long; pods lance-ovoid, strigose; plants known only from the Henry Mountains *A. henrimontanensis*

- Flowers ochroleucous or pink-purple, 18–25 mm long or more; pods spreading-hairy or villous; plants of various distribution but not as above 44
- 44(43). Flowers ochroleucous, sometimes suffused with purple; valves of pod scarcely obscured by the curly hairs *A. eurekensis*
- Flowers pink-purple; valves of pod obscured by contorted under hairs
..... *A. newberryi*
- 45(42). Leaflets mostly 17 or more per leaf, densely hirsute-tomentose, with longer straight hairs spirally twisted; pod bilocular, densely woolly hairy
..... *A. mollissimus*
- Leaflets mostly fewer than 17 per leaf, variously hairy, but not with longer straight hairs spirally twisted; pod unilocular, variously hairy 46
- 46(45). Leaflets oval to obovate, rounded apically; pods woolly hairy *A. utahensis*
- Leaflets oblanceolate to elliptic, obtuse to acute apically; pods merely strigose 47
- 47(46). Leaflets mostly acute; pods brightly mottled; plants of rocky ledges and talus of sandstone canyons and escarpments, mostly at lower elevations
..... *A. zionis*
- Leaflets obtuse to acute; pods not mottled; plants of loamy soils in mountain brush and upwards *A. argophyllus*
- 48(40). Plants odoriferous selenophytes, usually of clay soils 49
- Plants not smelling of selenium, usually not of clay soils 52
- 49(48). Calyx tube purple; petals pink-purple or bicolored; flowers erect-ascending at anthesis; pods leathery-inflated, ascending *A. preussii*
- Calyx tube greenish or whitish, not purplish; petals ochroleucous, or keel-tip purple, descending at anthesis; pods various 50
- 50(49). Stipules connate into a bidentate sheath, at least at the lowermost nodes; pods stipitate, pendulous, bisulcate *A. bisulcatus*
- Stipules all distinct, even at the lowermost nodes; pods sessile or shortly stipitate, ascending to spreading, not bisulcate 51
- 51(50). Calyx and petals concolorous, both whitish to cream-colored; pods cylindric, sessile, steeply ascending; plants rare in Henry Mountains *A. pattersonii*
- Calyx and petals discolorous, the calyx greenish, the petals ochroleucous; pods broadly ellipsoid, sessile or shortly stipitate, spreading-ascending; plants common *A. praelongus*
- 52(48). Plants subcaulescent; flowers pink-purple, 1–5 raceme; pods bladdery-inflated, unilocular, often more than 30 mm long *A. megacarpus*
- Plants differing in one or more respects from above 53
- 53(52). Stems arising from slender, rhizome-like caudex branches; flowers subsessile in head-like racemes, erect or ascending; pods erect, long-pilose, less than 12 mm long *A. agrestis*
- Stems arising from a superficial or subterranean caudex; flowers variously arranged, but seldom head-like and ascending to spreading; pods more than 17 mm long, spreading to pendulous 54
- 54(53). Stipules connate-sheathing, at least at the lowermost nodes; caudex sub-

- terranean 55
- Stipules all distinct, even at the lowermost nodes; caudex superficial to subterranean 56
- 55(54). Pods and ovaries long-stipitate; plants known from clay soils of the Chinle formation *A. ampullarius*
- Pods and ovaries sessile or subsessile; plants known from sandy alluvium *A. hallii*
- 56(54). Pods and ovaries stipitate, the stipe at maturity subequal to or surpassing the calyx 57
- Pods and ovaries sessile or nearly so 58
- 57(56). Stems decumbent to ascending; pods bladderly-inflated, unilocular, the body mostly more than 25 mm long; flowers ochroleucous; plants commonly of higher middle elevations *A. oophorus*
- Stems erect; pods not or only somewhat inflated, bilocular, the body usually less than 20 mm long; flowers ochroleucous or pink-purple; plants of lower elevations *A. eremiticus*
- 58(56). Flowers borne in subcapitate racemes; pods curved-oblong, dorsiventrally compressed, unilocular *A. cibarius*
- Flowers usually in elongate racemes; pods ovoid to curved-oblong, bilocular, compression variable 59
- 59(58). Plants from a subterranean caudex, usually less than 25 mm tall; pods curved-oblong, laterally or trigonously compressed; known from the Kaiparowits and Circle Cliffs regions, at moderate elevations *A. malacoides*
- Plants from a superficial caudex, often more than 25 cm tall; pods curved-oblong and dorsiventrally compressed, or bladderly-inflated and ovoid; wide-spread *A. lentiginosus*

Astragalus adanus A. Nels. Boise Milk-vetch. Perennial, caulescent, 20–45 cm tall, from a branching caudex; pubescence basifixed; stems erect or ascending; stipules 4–9 mm long, all distinct; leaves 7–13 (16) cm long; leaflets 13–27, ovate to oblong, lance-oblong, or elliptic, 6–26 mm long, retuse to obtuse, glabrous above, strigose below; peduncles (4) 10–18 cm long; racemes 4- to 27-flowered, the flowers ascending to spreading at anthesis, the axis 2–3 cm long in fruit; bracts lanceolate, 1.5–3.5 mm long; pedicels 1–5 mm long; bracteoles usually 2; calyx 6.9–10.3 mm long, often black-pilose, the tube 5.2–8 mm long, short-cylindric, the teeth 1.6–2.8 long, triangular-subulate; flowers ochroleucous, 15.5–22 mm long; pods erect, sessile, oblong-ovoid, 3–18 mm long, 5–6 mm thick; ovules 14–18. Known in Utah from a single collection at the base of Mt. Nebo, Juab Co. (Mt. Nebo R.S., R. K.

Gierisch 288, UTC); Idaho; 1 (0).

Astragalus adsurgens Pallas. Standing Milk-vetch. [*A. striatus* Nutt. ex Torr. & Gray; *A. nitidus* Douglas ex Hook.; *A. nitidus* var. *robustior* (Hook.) M. E. Jones.]. Perennial, caulescent, 15–45 cm tall, from a branching caudex; pubescence malpighian; stems decumbent-ascending to erect; stipules 6–10 mm long, at least the lowermost connate-sheathing; leaves 6–12 cm long; leaflets 15–23, 13–28 mm long, 3–9 mm wide, oblong to elliptic, acute or obtuse; peduncles 6–16 cm long; racemes 16- to 50-flowered, the flowers ascending at anthesis, the axis 1.5–13 cm long in fruit; bracts 2–5 mm long; pedicels to 0.8 mm long; bracteoles 0; calyx 5.8–10.5 mm long, the tube 4.4–7 mm long, short-cylindric, strigulose, the teeth 1.4–4.2 mm long, subulate; flowers 13–16 mm long, pink-purple; pods erect, sessile, ovoid-oblong, 7–12 mm long, 2.3–3.8

mm thick bilocular; ovules 9–16. Juniper-sagebrush community at 2000 m in Daggett Co. and 3175 m in Emery and Sanpete cos.; Alaska east to Manitoba and south to Washington, Idaho, Colorado, Nebraska, and Iowa; Eurasia. Our material belongs to *ssp. robustior* (Hook.) Welsh (*A. adsurgens* var. *robustior* Hook.); 3 (i).

Astragalus agrestis Douglas ex G. Don. Field Milkvetch. [*A. dasyglottis* Fisch. ex DC, not Pallas; *A. goniatus* Nutt. ex Torr. & Gray; *A. hypoglottis polyspermus* Torr. & Gray; *A. agrestis* var. *polyspermus* (Torr. & Gray) M. E. Jones.] Perennial, caulescent, 9–43 cm tall, from a subterranean caudex and long rhizome-like caudex branches; pubescence basifixed; stems erect to decumbent-clambering; stipules 4–11 mm long, at least the lowermost connate-sheathing; leaves 2–10 cm long; leaflets 13–23, 4–18 mm long, 2–5 mm wide, narrowly elliptic to lance-oblong, obtuse to retuse or acute, strigulose above and below; peduncles 1.5–15 cm long; racemes subcapitate, 5- to 15-flowered, the flowers ascending-erect at anthesis, the axis 0.5–2.5 mm long in fruit; bracts 3–7 mm long; pedicels 0.5–1.5 mm long; bracteoles 0; calyx 7–12.5 mm long, the tube 5–7.8 mm long, cylindric, villous, the teeth 2.5–5.5 mm long, linear; flowers 17–24 mm long, pink-purple, ochroleucous, or almost white; pods short-stipitate, the stipe 0.3–1 mm long, the body 7–10 mm long, 2.8–4.5 mm thick, unilocular, oblong-ellipsoid, silky-villous; ovules 14–26. Meadows and openings in sagebrush and aspen at 1850 to 3050 m in Box Elder, Cache, Carbon, Daggett, Duchesne, Emery, Garfield, Juab, Kane, San Juan, Sanpete, Sevier, Summit, Tooele, Uintah, Utah (US) Wasatch, and Wayne cos.; Yukon east to Ontario, and south to California, Nevada, New Mexico, Nebraska, and Iowa; 54 (xvi).

Astragalus alpinus L. Alpine Milkvetch. Perennial, caulescent, 2–30 cm tall, from a subterranean caudex and rhizomatous caudex branches; pubescence basifixed; stems decumbent to ascending; stipules 1.5–8 mm

long, at least the lowermost connate-sheathing; leaves 3–15 cm long; leaflets 15–26, 6–20 mm long, 2–10 mm wide, ovate to elliptic or oblong, retuse to rounded, strigulose above and below; peduncles 3–15 cm long; racemes 5- to 17-flowered, the flowers erect to declined at anthesis, the axis 0.5–5 cm long in fruit; bracts 1–2.5 mm long; pedicels 0.5–2.3 mm long; bracteoles 0; calyx 3.2–6.3 mm long, the tube 2–3.5 mm long, campanulate, strigulose, the teeth 1–3.2 mm long; flowers 9–12 mm long, pink-purple; pods pendulous, stipitate, the stipe 2–5 mm long, the body oblong-lanceolate in outline, 10–17 mm long, 1.5–4 mm thick, strigulose, semibilocular; ovules 5–11. Aspen and coniferous woods at 2430 to 2730 m in Grand (on Tavaputs Plateau) and Salt Lake (at Brighton) cos., and to be sought elsewhere; Alaska to Nova Scotia and south to Oregon, Nevada, New Mexico, Wisconsin and Vermont; Eurasia; 2 (0).

Astragalus amphioxys A. Gray. Crescent Milkvetch. Perennial (rarely flowering the first year), subacaulescent to shortly caulescent, 2–20 cm tall, from a weak caudex; pubescence malpighian; stems lacking or up to 20 cm long, the internodes often concealed by stipules; stipules 2–13 mm long, all distinct or the lowermost sometimes connate-sheathing; leaves 2–13 mm long; leaflets (1) 5–21, 3–20 mm long, 1–9 mm wide, elliptic to obovate or oblanceolate, obtuse to acute, strigose on both sides; peduncles 2–15 (20) cm long; racemes 2- to 13-flowered, the flowers ascending at anthesis, the axis 1–6.5 cm long in fruit; bracts 2.5–8 mm long; pedicels 0.6–2.5 mm long; bracteoles 0–2; calyx 6.3–14.2 mm long, the tube 5.2 mm long cylindric, strigose, usually purplish; the teeth 1.1–4.5 mm long, subulate; flowers 16.5–31 mm long, pink-purple, rarely white; pods ascending, sessile, 1.5–5 cm long, 5–12 mm thick, usually curved, mostly dorsiventrally compressed, unilocular, strigose; ovules 42–70. Two rather feeble and sympatric varieties are present.

1. Banner twice as long as the calyx or less; keel 14.3–19 mm long *A. amphioxys* var. *amphioxys*
- Banner more than twice as long as the calyx; keel 17–25 mm long *A. amphioxys* var. *vespertinus*

Var. *amphioxys*. [*A. shortianus* var. (?) *minor* A. Gray; *Xylophacos amphioxys* (A. Gray) Rydb. *X. aragalloides* Rydb.; *X. melanocalyx* Rydb.; *A. amphioxys* var. *melanocalyx* (Rydb.) Tidestr.; *A. marcus-jonesii* Munz].—Desert shrub, pinyon-juniper, and less commonly in mountain brush communities at 670 to 1830 m in Emery, Garfield, Grand, Iron, Kane, San Juan, Washington, and Wayne cos.; Nevada, Arizona, and New Mexico; 133 (xxxiii).

Var. *vespertinus* (Sheldon) M. E. Jones [*A. vespertinus* Sheldon]. Desert shrub, pinyon-juniper, and rarely in mountain brush communities at 670 to 1530 m in Emery, Garfield, Grand, Kane, San Juan, Washington, and Wayne cos.; Colorado, Arizona, Nevada, and New Mexico; 104 (xl).

Astragalus ampullarius S. Wats. Gumbo Milkvetch. [*Tragacantha ampullaria* (S. Wats.) Kuntze; *Phaca ampullaria* (S. Wats.) Rydb.]. Perennial, shortly caulescent, 2–28 cm tall, from a deep subterranean caudex; pubescence basifixed; stems prostrate-ascending, radiating; stipules 2–6 mm long, at least the lowermost connate-sheathing; leaves 3–14 cm long; leaflets 7–15 (19), 4–15 mm long, 2–12 mm wide, obovate, rounded to emarginate, strigose on both sides or glabrous above; peduncles 0.5–9.5 cm long; racemes 5- to 30-flowered, the flowers ascending at anthesis, the axis 1.2–13 cm long in fruit; bracts 1.5–3 mm long; pedicels 1–3 mm long; bracteoles 2; calyx 4.8–7.5 mm long, the tube 4.2–6 mm long short-cylindric, black strigose, the teeth 0.5–1.5 mm long, broadly triangular; flowers 13.5–22 mm long, pink-purple with white wing-tips, or ochroleucous; pods ascending-erect, stipitate, the stipe 9–19 mm long, the body ovoid to subglobose, inflated, 12–20 mm long, 8–11 mm thick, sub-unilocular, glabrous or nearly so; ovules ca.

12. Clay soils of the Chinle and Tropic (?) Shale formations at 970 to 1650 m in Kane (west of the Cockscomb) and Washington cos.; Mohave and Coconino cos., Arizona. The gumbo milkvetch is certainly one of the most unusual of the vast array of species in Utah. Its propensity for the variegated shales of the Chinle Formation near Kanab (the type locality) has long been known. The hypogeous caudex and short, prostrate-ascending stems, which persist in rosette form with marcescent stems and pods of previous years circular-reclining, bleached and skeleton-like, are quite unlike any of the taxa within the region. Phases of *A. eremiticus*, q.v., with inflated ovoid-oblong pods resemble *A. ampullarius*, but the caudex is superficial, the stipules are all distinct, and the stems commonly are erect; 11 (iii).

Astragalus argophyllus Nutt. ex Torr. & Gray. Silver-leaved Milkvetch. Perennial, acaulescent to subacaulescent, 1.5–12 cm tall, arising from a superficial caudex; pubescence basifixed; stems obsolete or to 10 cm long, prostrate; stipules 2–10 mm long, all distinct; leaves 1.5–12 cm long; leaflets 7–21, 2–12 mm long, 1–6 mm wide, elliptic, oblanceolate or obovate, acute to obtuse, pilose above and below; peduncles to 9 cm long; racemes 1- to 6-flowered, the flowers ascending at anthesis, the axis little elongating in fruit; bracts 1.8–6.5 mm long; pedicels 1.2–3.8 mm long, bracteoles 0–2; calyx 9–16.8 mm long, the tube 6.5–11.8 mm long, cylindric, pilose with mixed black and white hairs, the teeth 1.5–6 mm long, linear; flowers 15–25 mm long, pink-purple; pods ascending, sessile, 1.5–3.7 mm long, 5–13 mm thick, ovoid-acuminate, unilocular, strigose or rarely villous, the valves not obscured; ovules 25–43. Three rather distinctive varieties are present.

- 1. Flowers 15–17.5 mm long, the keel 12–15.2 mm long; pods curved-ellipsoid, densely silky strigose, 3–4 times longer than broad *A. argophyllus* var. *panguicensis*
- Flowers 18–25 mm long, the keel 15.9–21 mm long; pods various, variably pubescent, mostly 2–3 times longer than broad 2
- 2(d). Petals bright pink-purple, the flowers 22–25 mm long; plants of grasslands, streambanks, and lake shores *A. argophyllus* var. *argophyllus*

- Petals dull pink-purple or pale, the flowers 18–22.5 mm long; plants of sagebrush and mountain brush communities *A. argophyllus* var. *martinii*

Var. *argophyllus*. [*Xylophacos argophyllus* (Nutt.) Rydb.; *A. uintensis* M. E. Jones, in part; *X. uintensis* (M. E. Jones) Rydb.]. Meadows, stream banks, and lake shores at 1400 to 1970 m in Box Elder, Cache, Carbon, Salt Lake, San Juan, Sanpete, Summit, Utah, Wasatch, and Weber cos.; Nevada, Idaho, and Wyoming; 22 (ii).

Var. *martinii* M. E. Jones. [*A. argophyllus* var. *cnicensis* M. E. Jones; *A. argophyllus* var. *pephragmenoides* Barneby]. Sagebrush, mountain brush, aspen, and spruce-fir communities at 1700 to 2600 m in Beaver, Carbon, Duchesne, Emery, Grand, Iron, Juab, Millard, Piute, Salt Lake, Sanpete, Sevier, Summit, Tooele, Uintah, Utah, Wasatch, and Wayne cos.; Idaho, Wyoming, and Colorado; 54 (xi).

Var. *panguicensis* (M. E. Jones). M. E. Jones; [*A. chamaeleuce* var. *panguicensis* M. E. Jones; *A. panguicensis* (M. E. Jones) M. E. Jones; *Batidophaca sabinarum* Rydb.; *A. sabinarum* (Rydb.) Barneby]. Ponderosa pine, aspen-douglas fir-limber pine, white fir, sagebrush, and pinyon-juniper communities at 2130 to 2900 m in Garfield, Iron, Kane and Washington cos.; Arizona; 50 (ix).

Astragalus arctioides (M. E. Jones) Barneby. Cushion orophaca. [*A. sericoleucus* var. *arctioides* M. E. Jones]. Perennial, pulvinate caespitose, from a branching caudex; pubescence malpighian; stems almost entirely concealed by stipules; stipules 3.5–7 mm long, connate-sheathing, hyaline, glabrous dorsally or nearly so; leaves 0.6–2 cm long, palmately trifoliate, the leaflets 3–7.5 mm long, 1.2–1.8 mm wide, spatulate to elliptic, acute, silvery-strigose on both sides; peduncles 7–15 mm long; racemes 2- or 3-flowered, the flowers ascending, the axis very short; bracts 2–3 mm long; pedicels 1–1.5 mm long; bracteoles 0; calyx 3.3–4.2 mm long, the tube 2.1–2.3 mm long, campanulate, densely long-strigose, the teeth 1.2–2 mm long; flowers 6–8 mm long, pink-purple (rarely white); pods ascending, sessile, 4–5 mm long, 1.2–2 mm thick, densely hairy, unilocular. Volcanic ash “barrens” at 1769 m in Daggett Co.; Montana and Wyoming; 2 (0).

Astragalus asclepiadoides M. E. Jones. Milkweed Milkvetch. [*Jonesiella asclepiadoides* (M. E. Jones) Rydb.]. Perennial, caulescent, 7–62 cm tall, arising from a usually superficial caudex; pubescence basifixed; stems glabrous, erect; stipules 2–15 mm long, all distinct; leaves simple, 1.5–6.5 cm long, 1–5.5 cm wide, ovate, orbicular, or cordate, obtuse to rounded or retuse, glabrous; peduncles 0.5–4.5 cm long; racemes 2- to 12-flowered, the flowers ascending, the axis 0.4–2.5 cm long in fruit; bracts 1–5 mm long; pedicels 1–5 mm long; bracteoles usually 2; calyx 10–17 mm long, the tube 8.3–13 mm long, cylindric, strigose with black hairs, the teeth 1.5–3.8 mm long, linear to subulate; flowers 17–27 mm long, suffused purple or almost ochroleucous; pods erect-ascending, stipitate, the stipe 10–21 mm long, the body ovoid or ovoid-ellipsoid, inflated, 25–35 mm long, 11–16 mm thick, unilocular, glabrous; ovules ca 40. Saline desert shrub vegetative types on Mancos Shale, Tropic Shale, Carmel, Moenkopi, Arapien, and Duchesne River formations at 1250 to 1900 m in Carbon, Duchesne, Emery, Garfield, Grand (type from Cisco), Sanpete, Sevier, Uintah, and Wayne cos.; Colorado. This singular selenophyte was first collected by M. E. Jones (1923) “. . . on sand-bars along the Price River. . .” in September of 1888, but the locality is apparently unique, for it is commonly distributed on the clay soils of the Mancos Shale in that vicinity; 42 (xvi).

Astragalus australis Fischer. Subarctic Milkvetch. (*A. aboriginum* Richards., for a complete list of synonyms, see Barneby 1964.) Perennial, caulescent, 6–20 cm tall, from a superficial caudex; pubescence basifixed; stems pubescent, erect; stipules 2–7 cm long, at least the lowermost connate-sheathing; leaves 2–7 cm long, sessile; leaflets 7–15, 3–22 mm long, 1–7 mm wide, elliptic, acute, villous to glabrate on both sides; peduncles 2–8.5 cm long; racemes 2- to 30-flowered, compact and ascending at anthesis, the axis 1–10 cm long in fruit; bracts 1.2–5 mm long; pedicels 0.8–3.5 mm

long; bracteoles 0; calyx 3.7–6.4 mm long, the tube 2.1–3.9 mm long, campanulate, villous, the teeth 1–3 mm long, subulate; flowers 7.5–12.6 mm long, ochroleucous or suffused with pink, the wing petals bilobed apically; pods pendulous, stipitate, the stipe 2.5–6 mm long, the body obliquely and narrowly elliptic in outline, 13–27 mm long, 3–6 mm wide, semibilocular, glabrous; ovules 8–16. The subarctic milkvetch is one of the poorly known species within Utah. It is recorded from only three collections. The plants grow on calcareous ridges with grasses and shrubs at elevations of from 1750 to 3050 m in Piute (Marysville, 10000 ft., Jones in 1899, POM), Emery, and Wasatch cos.; Alaska east to Gaspé, and south to Oregon, Nevada, Colorado, and South Dakota; 3 (ii).

***Astragalus barnebyi* Welsh in Welsh, Atwood, & Reveal.** Barneby Milkvetch. [*A. desperatus* var. *conspicuosus* Barneby]. Perennial, acaulescent or subacaulescent, 1.5–5 cm tall, from a branching caudex; pubescence basifixed; stems 0–5 cm long, mostly obscured by stipules; stipules 2–7 mm long, at least some connate-sheathing; leaves 1.5–5 cm long; leaflets 7–17, 3–9 mm long, 0.9–3.2 mm wide, elliptic to oblanceolate, acute to obtuse, strigose on both sides; peduncles 0.5–5.2 cm long; racemes 2- to 8-flowered, the flowers ascending at anthesis, 0.5–2.5 cm long in fruit; bracts 2–4 mm long; pedicels 0.5–1.5 mm long; calyx 6.1–7.7 (8.4) mm long, the tube 5.2–6.5 mm long; short-cylindric, pilose with mixed black and white hairs, the teeth

0.9–1.7 mm long, subulate; flowers 12.2–15 mm long, pink-purple or bicolored; pods declined, sessile or short-stipitate, ovoid-ellipsoid, curved, 12–19 mm long, 5–6 mm thick, subunilocular, long silky-pilose; ovules ca. 20. Pinyon-juniper woods and mixed desert shrublands on platy shales of the Carmel or on sandstones of Jurassic and Cretaceous ages at 1430 to 1830 m in eastern Garfield and Wayne cos.; Navajo Co., Arizona. The Barneby milkvetch is a near congener of *A. desperatus*, q.v., from which it differs in the larger size of flowers and parts, and in the usually more compact habit of growth; 10 (iv).

***Astragalus beckwithii* Torr. & Gray.** Beckwith Milkvetch. Perennial, caulescent, 5–40 (70) cm tall, from a branching caudex; pubescence basifixed; stems decumbent to ascending or erect; stipules 2–10 mm long, all distinct; leaves 2–15 cm long; leaflets (7) 11–27, 3–17 (25) mm long, 2–9.6 mm wide, orbicular to obovate, obtuse to retuse, glabrous to glabrate on both sides; peduncles 3–15 cm long; racemes 7- to 16-flowered, the flowers ascending at anthesis, the axis 1–7 cm long in fruit; bracts 1–7 mm long; pedicels 1–3.5 mm long; bracteoles 2; calyx 7–9.5 mm long, the tube 3.5–5.7 mm long, short-cylindric, sparingly strigose to glabrous, the teeth 2.5–4.4 mm long, subulate; flowers 14.5–21 mm long, ochroleucous to whitish or pink-purple; pods ascending to declined, stipitate, the stipe (gynophore) 1.5–5 mm long, the body obliquely leathery, unilocular; ovules 18–41. Two distinctive varieties are known in Utah.

1. Flowers pink-purple or bicolored; plants of western Beaver, Juab, and Millard cos. *A. beckwithii* var. *purpureus*
- Flowers ochroleucous, concolorous; plants of central to northwestern Utah....
..... *A. beckwithii* var. *beckwithii*

Var. *beckwithii*. [*Tragacantha beckwithii* (Torr. & Gray.) Kuntze; *Phaca beckwithii* (Torr. & Gray.) Piper; *Phacomene beckwithii* (Torr. & Gray.) Rydb.] Juniper-pinyon, sagebrush, bunch-grass, and mountain brush communities at 1330 to 2300 m in Beaver, Carbon, Box Elder, Davis, Millard, Morgan, Piute (US), Salt Lake, Sevier,

Tooele, Utah, and Weber cos.; Nevada. Plants of var. *beckwithii* are indistinguishable in anthesis from those of *A. oophorus* var. *caulescens*, with which it is sympatric in part of its range (q.v.); 61 (v).

Var. *purpureus* M. E. Jones. [*A. artemisiarum* M. E. Jones; *Phaca artemisiarum* (M. E. Jones) Rydb.; *Phacomene artemisia-*

rum (M. E. Jones) Rydb.]. Pinyon-juniper and cool-desert shrublands at 1370 to 2200 m in western Beaver, Juab, Millard, and Tooele cos.; Nevada; 24 (5).

Astragalus bisulcatus (Hook.) A. Gray. Two-grooved Milkvetch. Perennial, caulescent, 15–70 cm tall, from a caudex; pubescence basifixed; stems erect; stipules 2.5–10 mm long, at least the lowermost connate-sheathing; leaves 3–13.5 cm long; leaflets (7) 15–35, 5–33 mm long, 1.5–11 mm wide, lance-oblong to oblong, elliptic or oblanceolate 2–16 cm long; racemes 25– to 80-flowered, the flowers declined at anthesis, the axis 3–25 cm long in fruit; bracts 2.5–6 mm long; pedicels 1–3.5 mm long;

bracteoles 0–2; calyx 3.5–9.6 mm long, gibbous-saccate, the tube 2.8–5.7 mm long, obliquely campanulate, sparingly strigose, the teeth 1–3 mm long, subulate; flowers 8–18 mm long, ochroleucous, whitish, or pink-purple, the keel-tip usually purple; pods pendulous, stipitate, the stipe about equaling the calyx tube, the body ellipsoid, 6.5–20 mm long, 2–4.5 mm thick, dorsiventrally compressed, bisulcate, unilocular, strigose or glabrous; ovules 5–15. The two-grooved milkvetch is an ill-scented primary indicator of selenium in most areas, but non-scented populations are known. Three distinctive varieties are present in Utah.

1. Flowers bright pink-purple; calyx purple; plants of Daggett, Uintah and Grand cos. *A. bisulcatus* var. *bisulcatus*
- Flowers ochroleucous or whitish, the keel often purple-tipped; calyx ochroleucous, whitish, or greenish; distribution various 2
- 2(1). Flowers 8–11 mm long; body of pod 6.5–9.5 mm long, prominently reticulate; plants usually montane in Utah *A. bisulcatus* var. *haydenianus*
- Flowers 10–18 mm long; body of pod 10–17 mm long, smooth or faintly reticulate; plants usually not montane *A. bisulcatus* var. *major*

Var. *bisulcatus*. [*Phaca bisulcata* Hook.: *Tragacantha bisulcata* (Hook.) Kuntze; *Diholcos bisulcatus* (Hook.) Rydb.]. River terraces at 1530 to 2130 m in Daggett, Grand, and Uintah cos.; Alberta east to Manitoba and south to Idaho, New Mexico, and Kansas; 6 (ii).

Var. *haydenianus* (A. Gray) Barneby. [*A. haydenianus* A. Gray ex Brand.; *Tragacantha haydeniana* (A. Gray) Kuntze; *Diholcos haydenianus* (A. Gray) Rydb.]. Sagebrush-mountain brush communities at 2130 to 2600 m in Carbon, Duchesne, San Juan, Sanpete, Sevier, Uintah, and Utah cos.; Wyoming, Colorado, New Mexico, and Arizona; 16 (v).

Var. *major* (M. E. Jones) Welsh comb. nov. based on *A. haydenianus* var. *major* M. E. Jones Zoe 2: 240. 1891. [*A. scobatinatulus* Sheldon; *Diholcos scobatinatulus* (Sheldon) Rydb.]. Pinyon-juniper, sagebrush, mountain brush, and salt desert shrub at 1530 to 2300 m elevation in Beaver, Garfield, Juab, Kane, Rich, Sanpete, Sevier, and Washington cos.; Wyoming, Colorado, and

Arizona. This taxon was included within an expanded var. *bisulcatus* by Barneby (1964), who considered it as being “taxonomically negligible.” However, var. *major* differs in about the same manner and degree as do other varieties in *Astragalus*. It is the dominant type within Utah. A population of var. *major* from north of Glendale in western Kane Co., lacks the characteristic odor of selenium commonly associated with all varieties of *A. bisulcatus*; 24 (vii).

Astragalus bodinii Sheldon. Bodin Milkvetch. [*Phaca bodinii* (Sheldon) Rydb.; *A. debilis* sensu authors, not A. Gray (?); *A. yukonis* M. E. Jones; *P. yukonis* (M. E. Jones) Rydb.; *A. bodinii* var. *yukonis* (M. E. Jones) B. Boi.]. Perennial, caulescent, 15–80 cm long, from a superficial or buried caudex; pubescence basifixed; stems straggling on other plants; stipules 1–7 mm long all connate-clasping; leaves 2.5–8.5 cm long; leaflets 7–17, 2–12 mm long, 1–7 mm wide, oblanceolate to obovate, ovate or elliptic, rounded to emarginate or acute, strigose beneath, glabrous above; peduncles 1.5–10 cm

long; racemes 3- to 15-flowered, the flowers ascending at anthesis, the axis 0.5–9 cm long in fruit; bracts 0.5–2.5 mm long; pedicels 0.7–2.2 mm long; bracteoles 0; calyx 4.5–5.2 mm long, the tube 3.4–3.8 mm long, campanulate, black-strigose, the teeth 1.5–1.8 mm long, subulate; flowers 9.5–10.2 mm long, pink-purple; pods ascending to spreading, stipitate, the stipe (gynophore) to 1 mm long, the body ellipsoid, 5.5–10 mm long, 3–4.5 mm thick, somewhat trigonous, unilocular, strigose; ovules 2–10. Wet meadows at 2000 to 2200 m in Rabbit Valley near Loa, Wayne Co. and along Otter Creek in Piute and Sevier cos.; Alaska east to Newfoundland and south to Alberta and Manitoba, and from Wyoming, Nebraska, and Colorado. Of the great number of species present in Utah, only a handful are true mesophytes. Included in that category are *A. agrestis*, *A. argophyllus* var. *argophyllus*, *A. bodinii*, *A. canadensis*, and *A. diversifolius*. They grow almost exclusively in meadows or other sites which are moist through much of the year. The habitat has been exploited to an extent almost unknown in more arid situations and is seldom explored botanically because of the exploitation, fencing, and private ownership. Despite that exploitation, *A. bodinii* has persisted from its initial discovery by Lester F. Ward (602, US, BRY) in Rabbit Valley, Utah on 18 August, 1875. Possibly *A. bodinii* will yet be found in other meadowlands of the state; 8 (iii).

Astragalus brandegei T. C. Porter in Port. & Coult. Brandege Milkvetch. Perennial, though sometimes flowering as an annual, caulescent, 5–35 (40) cm long, from a branching caudex; pubescence basifixed; stems prostrate-spreading, very slender; stipules 1.5–5 mm long, at least the lowermost usually connate-clasping; leaves 2–11.5 cm long; leaflets 5–15, 6–27 mm long, 0.5–2.6 mm wide, linear-filiform to narrowly oblong, acute to obtuse, strigose beneath, glabrous above; peduncles 2.5–14 cm long, very slender; racemes 1- to 5-flowered, the flowers ascending at anthesis, the axis 0.5–6 cm long in fruit; bracts 1–2 mm long; pedicels 1.2–4 mm long; bracteoles 2; calyx 2.7–4 mm long, the tube 1.8–2.5 mm long,

campanulate, black-strigose, the teeth 0.9–2 mm long, subulate; flowers 4.5–6 mm long, ochroleucous or tinged violet; pods pendulous to ascending, sessile or subsessile, the body obovoid to oblong-ellipsoid, 10–18 mm long, 3.5–5 mm thick, slightly dorsiventrally compressed, semibilocular, strigose. Volcanic gravels in mixed shrublands or pinyon-juniper at 1650 to 2430 m in Carbon, Emery (US), Garfield (US), Piute, and Wayne cos.; Colorado, New Mexico, and Arizona. This is a cryptic plant that is seldom collected, probably because of its inconspicuous, tiny flowers, slender peduncles, and slender prostrate stems; 4 (iii).

Astragalus bryantii Barneby. Bryant Milkvetch. Perennial, caulescent, 35–80 cm tall, from a caudex; herbage basifixed; stems erect; stipules 3–8 mm long, all distinct; leaves 4–12 cm long; leaflets 11–21, 5–15 mm long, 2–12 mm broad, ovate, obovate, or broadly elliptic, emarginate to truncate, strigose beneath, glabrous above; peduncles 4–10 cm long; racemes 12- to 22-flowered, the flowers spreading-declined at anthesis, the axis 6–13 cm long in fruit; bracts 2–3.5 mm long; pedicels 0.5–3 mm long; bracteoles 0–2; calyx 7–9.3 mm long, the tube 5.1–6.4 mm long, short-cylindric, strigose, the teeth 1.6–3.4 mm long, subulate; flowers 14–19.5 mm long, pink-purple or bicolored; pods spreading-ascending, sessile or subsessile, the body linear to linear-lanceolate in outline, 1.5–3 cm long, 3–5 mm thick, laterally compressed, bilocular, strigose, to glabrous; ovules 22–27. Talus slopes in mixed desert shrub communities at 770 to 1070 m in Lost Eden and West Creek canyons, Glen Canyon, San Juan Co.; Grand Canyon, Arizona. The low elevation reaches of Glen Canyon are flooded almost to the 1128.5 m level by the water of Lake Powell, and it seems probable that the Bryant milkvetch is extinct in Utah. The plants simulate *A. lentiginosus* var. *palans*, but differ in pod characters; 1 (0).

Astragalus callithrix Barneby. Callaway Milkvetch. Perennial, subcaulescent, 2–11 cm tall, from a caudex; pubescence basifixed; stems lacking or to 10 cm long, prostrate, the internodes often concealed by stipules; stipules 2–5 mm long, all distinct,

leaves 2-11 cm long; leaflets 9-21, 2-13 mm long, 1.5-10 mm wide, obovate, sub-orbicular, or lanceolate, obtuse to truncate or emarginate, villous on both sides; peduncles 2-8 (12) cm long; racemes 5- to 15-flowered, the flowers ascending at anthesis, the axis 0.5-6 cm long in fruit; bracts 3-7.5 mm long; pedicels 1-1.5 mm long; bracteoles 0-2; calyx 6.8-13.3 mm long, the tube 5.5-10.8 mm long, cylindric, villous-pilose, purplish, the teeth 1-3.2 mm long; flowers bright pink-purple, 16-26 mm long; pods ascending-spreading, sessile, oblong-ovoid, 10-20 mm long, 5-7.5 mm thick, dorsiventrally compressed, curved, long hairy (the valves not obscured), unilocular; ovules 24-34. Sandy flats and dunes in mixed desert shrublands at 1550 to 1625 m in western Millard Co.; Nye Co., Nevada; a Great Basin endemic; 3 (0).

Astragalus calycosus Torr. ex S. Wats. Torrey Milkvetch. Perennial, low, acaulescent, 1-12 cm tall, from a branching caudex; pubescence malpighian; stems lacking

or to 2 cm long, the internodes concealed by stipules; stipules 1.5-6 mm long, all distinct; leaves 1-8 (12) cm long; leaflets (1) 3-13, 2-19 mm long, 1-7 mm wide, obovate, oblanceolate, or elliptic, obtuse to acute, silvery strigose on both sides; peduncles 0.5-10 cm long, rarely longer; racemes 1- to 8-flowered, the flowers ascending to spreading at anthesis, the axis 0.2-2.5 cm long in fruit; bracts 0.5-2 mm long; pedicels 0.7-3 mm long; bracteoles 0-2; calyx 5-8.5 mm long, the tube 4-6.7 mm long, campanulate to shortly-cylindric, strigose, the teeth 1-4.2 mm long, subulate; flowers 10-16.5 mm long, varicolored, ochroleucous to shades of pink and purple, with white or pale wing-tips, the wings bilobed apically; pods ascending, sessile, narrowly oblong, usually curved, 8-25 mm long, 3-45 mm thick, laterally compressed, bilocular, strigose. Rather widespread and distinctive, the plants of Torrey milkvetch are separable into three varieties, two rare and one common.

1. Leaves with 5-13 leaflets along a rachis usually more than 1 cm long; scapes erect-ascending, usually over 7 cm long; raceme axis usually more than 2 cm long; plants of Washington Co. *A. calycosus* var. *scaposus*
- Leaves with 3-13 leaflets along a rachis less than 1 cm long; scapes ascending to decumbent, 1-7 cm long; raceme axis less than 2 cm long; distribution various 2
- 2(1). Leaflets 7-13, mostly 2-6 mm long; alpine plants of extreme west-central Utah, rare *A. calycosus* var. *mancus*
- Leaflets 3-7, mostly 5-19 mm long; plants of lower elevations, widespread, except in the northeastern third of Utah *A. calycosus* var. *calycosus*

Var. *calycosus*. [*Tragacantha calycosa* (Torr.) Kuntze; *Hamosa calycosa* (Torr.) Rydb.; *A. brevicaulis* A. Nels.]. Mixed desert shrublands, pinyon-juniper, and ponderosa pine communities at 1430 to 2730 m in Beaver, Box Elder, Emery, Garfield, Iron, Juab, Kane, Millard, San Juan, Sanpete, Sevier, Tooele, Utah, Washington and Wayne cos.; Wyoming, Idaho, Nevada, California, and Arizona; 92 (xviii).

Var. *mancus* (Rydb.) Barneby. [*Hamosa manca* Rydb.; *A. mancus* (Rydb.) Wheeler.] Ridgetops at 2650 to 3660 m in Deep Creek Mts., Juab Co.; Nevada; 5 (i).

Var. *scaposus* (A. Gray) M. E. Jones. (*A. scaposus* A. Gray; *H. scaposa* (A. Gray) Rydb.; *A. candicans* Greene. Ridgetops at ca. 2730 m in Beaverdam Mts., Washington Co.; Nevada, Arizona, Colorado, and New Mexico; 1 (0).

***Astragalus canadensis* L.** Canada Milkvetch. Perennial, caulescent, 15-120 cm tall, erect or ascending; stipules 3-12 mm long or more, at least the lowermost connate-sheathing; leaves 5-30 cm long; leaflets 13-35, 10-52 mm long, 6-16 mm wide, lanceolate, lance-oblong, or elliptic, obtuse to emarginate, strigose on both sides or

glabrous above; peduncles 4–22 cm long; racemes many-flowered, the flowers spreading-declined in anthesis, the axis 2.5–16 cm long in fruit; bracts 1.5–10 mm long; pedicels 0.5–3.5 mm long; bracteoles 0–2; calyx 4.6–10.5 mm long, the tube 4–8.5 mm long, short-cylindric, strigose, the teeth 1.2–4.4 mm long, subulate or triangular; flowers

13.5–17.5 mm long, ochroleucous; pods erect, sessile or subsessile, cylindroid, 10–20 mm long, 2.9–5.2 mm thick, bilocular, strigose or glabrous; ovules 16–28. Two varieties of Canada milkvetch are known from Utah. These are peculiar among our many low-elevation species in flowering in mid-summer.

1. Pods and ovaries glabrous, terete at maturity, not sulcate dorsally; calyx teeth 2.5–4.1 mm long; plants mostly 40–120 cm tall..... *A. canadensis* var. *canadensis*
- Pods and ovaries pubescent, sulcate dorsally at maturity; calyx teeth mostly 1–2.5 mm long; plants 10–50 cm tall *A. canadensis* var. *brevidens*

Var. *brevidens* (Gand.) Barneby. [*A. mertonii* f. *brevidens* Gand.]. Meadows, stream banks, lake shores, and hillsides at 1830 to 2300 m in Box Elder, Cache, Daggett, Rich, Summit, and disjunctly in Washington cos.; Montana, Idaho, Oregon, California, Nevada, Wyoming, and Colorado; 10 (iii).

Var. *canadensis*. [*A. carolinianus* L.]. Stream terraces and lake shores at 1370 to 1600 m in Cache, Piute (Rydberg & Carlton 6967, 20 July 1905, Sevier River below Marysville, US), Salt Lake, Utah, and Wasatch cos.; British Columbia east to Ontario and south to Washington, New Mexico, Texas, Louisiana, Alabama, and South Carolina; 6 (i).

***Astragalus ceramicus* Sheldon.** Painted Milkvetch. [*Phaca picta* A. Gray; *A. pictus* (A. Gray) A. Gray, not Boiss. & Gaill.; *A. pictus* var. *foliolosus* A. Gray; *Tragacantha picta* (A. Gray) Kuntze; *A. angustus* var. *pictus* (A. Gray) M. E. Jones; *A. angustus* var. *ceramicus* (Sheldon) M. E. Jones; *A. pictus* var. *angustus* M. E. Jones, type from Montezuma Canyon; *A. ceramicus* var. *jonesii* Sheldon; *A. angustus* (M. E. Jones) M. E. Jones; *A. pictus* var. *magnus* M. E. Jones, type from Silver Reef.]. Perennial, caulescent, 3–40 cm tall, from elongate rhizome-like caudex branches and deeply-buried caudex; pubescence malpighian, stems sprawling to erect; stipules 1.5–9 mm long, at least some connate-sheathing; leaves 2–17 cm long; leaflets 3–13 or only one, the terminal continuous with the rachis, 3–30 mm long, 0.5–3 mm wide, filiform to narrowly

oblong, obtuse to retuse or acute; peduncles 0.7–7.5 cm long; racemes 2- to 15-flowered (rarely more), the flowers ascending to declined at anthesis, the axis 1–12 cm long in fruit; bracts 1–2.5 mm long; pedicels 0.7–3.1 mm long; bracteoles 0; calyx 3.1–4.2 mm long, the tube 2.1–3.3 mm long, campanulate, strigose, the teeth 1–2.4 mm long, subulate; flowers 6.3–9.5 mm long, dull purplish to pink, or rarely whitish; pods pendulous, stipitate, the stipe 1–3.3 mm long, the body bladdery-inflated, ellipsoid to ovoid, 12–30 mm long, usually mottled, glabrous, unilocular; ovules 12–29. Sandy soils in pinyon-juniper, sagebrush, stream bank, grassland, and mixed desert shrub communities at 1270 to 2360 m in Beaver, Emery, Garfield, Grand, Juab, Kane, San Juan, Tooele, Uintah, Wayne, and Washington cos.; Colorado, New Mexico, Arizona. Our materials belong to var. *ceramicus*; 40 (x).

***Astragalus chamaeleuce* A. Gray in Ives.** Cidada Milkvetch. [*Phaca pygmaea* Nutt.; *Tragacantha pygmaea* (Nutt.) Kuntze; *A. cicadae* var. *laccoliticus* M. E. Jones, type from Henry Mts.; *A. pygmaeus* var. *laccoliticus* (M. E. Jones) M. E. Jones.]. Perennial, acaulescent to subacaulescent, 2–10 cm tall, from a caudex; pubescence malpighian; stems lacking or to 6 cm long and prostrate, the internodes mostly obscured by the stipules; stipules 2–7 mm long, all distinct; leaves 2–10 cm long; leaflets 5–17, 4–15 mm long, 2–10 mm wide, obovate to oblanceolate, obtuse to truncate or emarginate,

strigose on both sides; peduncles 1-8 cm long; racemes 2- to 11-flowered, the flowers spreading-ascending, the axis 0.9-2 cm long in fruit; bracts 2-5 mm long; pedicels 1-3.5 mm long, short-cylindric, strigose, the teeth 1.5-2.9 mm long; flowers ochroleucous or tinged purplish to pink-purple; pods ascending, sessile, oblong-ovoid or ellipsoid, 2-4 cm long, 7-16 mm thick, the fleshy valves ca. 3 mm thick, shrinking in ripening, the papery exocarp ultimately lustrous, separating from the veins beneath and appearing quite smooth, mottled, strigose, unilocular; ovules 37-46. Juniper-pinyon, sagebrush, mixed desert shrub, and grassland communities at 1530 to 2130 m in Daggett, Duchesne, Emery, Garfield, Grand, and Uintah cos.; Colorado and Wyoming. The cicada milkvetch is the only subcaulescent species of *Astragalus* of its type with malpighian hairs known from the Uinta Basin. To the south of there it is rare, but mingles with both *A. amphioxys* and *A. cymboides*, and mature fruit is necessary for positive identification of *A. chamaeleuce* from those entities; 29 (x).

***Astragalus chloodes* Barneby.** Grass Milk-vetch. Perennial, acaulescent or sub-caulescent, 5-24 cm tall, from a branching caudex; pubescence malpighian; stems obscured by stipules; stipules 2-8 mm long, all usually connate-sheathing; leaves simple, 1-13 (17) cm long, 1-3 mm wide, flat or involute, strigose on both sides; peduncles 2-9 cm long; racemes loosely 7- to 23-flowered, the flowers ascending at anthesis, the axis 4.5-24 cm long in fruit; bracts 2-4.5 mm long; pedicels 1-2.5 mm long; bracteoles 0; calyx 4.5-8.5 mm long, the tube 2-3 mm long, campanulate, strigose, the teeth 2.5-5.2 mm long, rigid-spreading; flowers 6.2-8.2 mm long, pink-purple; pods erect or ascending, sessile, obliquely lanceolate or oblong in outline, curved, 8-12 mm long, 1.7-3 mm wide, glabrous or strigose, unilocular; ovules 4-8. Entrada Sandstone (or less commonly on Navajo Sandstone) hogbacks and cuernas in pinyon-juniper and mixed desert shrub communities at 1450 to 1700 m in Uintah Co.; endemic. The grass milkvetch simulates a grass, not only in its narrow leaves, but also in the flowers in

bud which resemble grass spikelets; 11 (ii).

***Astragalus cibarius* Sheldon.** Browse Milkvetch. [*A. webberi* var. *cibarius* (Sheldon) M. E. Jones; *Xylophacos cibarius* (Sheldon) Rydb.; *A. arietinus* M. E. Jones, type from Cedar City.]. Perennial, caulescent, 6-30 cm tall, from a branching caudex; pubescence basifixed; stems decumbent to ascending; stipules 3-8 mm long, all distinct; leaves 3.5-10 cm long; leaflets 11-19, 4-17 mm long, 2-13 mm wide, obovate, oblong, oblanceolate, obtuse or retuse, strigose beneath, glabrous above; peduncles 3-8 cm long; racemes 4- to 14-flowered, subcapitate at early anthesis, the flowers spreading-ascending, the axis 0.5-2.7 cm long in fruit; bracts 2-4 mm long; pedicels 1-2.5 mm long; bracteoles 0-2; calyx 6.4-9.2 mm long, the tube 5-7 mm long, cylindric, strigose, the teeth 1.4-2.5 mm long; flowers 15-19 mm long, pink-purple with white wing-tips or whitish to ochroleucous and variously tinged; pods ascending, subsessile, ellipsoid to oblong, 17-32 mm long, 7-10 mm thick, curved to almost straight, strigose, unilocular, woody or stiffly leathery; ovules 27-32. Mountain brush, sagebrush, juniper-pinyon, and mixed desert shrub communities at 1630 to 2430 m in Beaver, Box Elder, Cache, Davis, Garfield, Iron, Juab, Millard, Morgan, Salt Lake, Sanpete, Sevier, Summit, Tooele, Utah, Wasatch, Washington, and Weber cos.; Nevada, Idaho, Montana, Wyoming, and Colorado. The browse milkvetch is allied to *A. ensiformis* and *A. malacoides*, but is easily distinguished from them both morphologically and geographically; 108 (xiv).

***Astragalus cicer* L.** Chickpea Milkvetch. [*Cystium cicer* (L.) Stev.]. Perennial, caulescent, 20-70 cm tall or more, from a branching caudex; pubescence basifixed; stems prostrate to ascending; stipules 2-8 mm long, at least the lowermost connate-sheathing; leaves 4-21 cm long; leaflets 17-27 (31), 5-40 mm long, 2-14 mm wide, lance-elliptic to oblong, acute to obtuse, strigose on both sides or glabrous above; peduncles 4-12 cm long; racemes densely 10- to 30-flowered, the flowers ascending at anthesis, the axis 2-7 cm long in fruit; bracts 2-6.5 mm long; pedicels 0.3-1.5 mm long; brac-

teoles 0; calyx 6–9 mm long, the tube 5–6 mm long, short-cylindric, strigulose, the teeth 1.6–3 mm long; flowers 12.5–16.5 mm long, ochroleucous; pods ascending, or by crowding, spreading, subsessile, the body ovoid or subglobose, strongly inflated, 6–14 mm long, 6–10 mm thick, pilose, bilocular. Introduced forage plant, escaping and persisting in pinyon-juniper, sagebrush, and aspen communities at 1770 to 2170 m in Sanpete Co., and to be expected elsewhere; indigenous to Europe; 3 (0).

***Astragalus coltonii* M. E. Jones.** Colton Milkvetch. Perennial, caulescent, 10–75 cm tall, from a branching caudex; pubescence basifixed; stems erect or ascending; stipules 1–7 mm long, all distinct; leaves 2–10 cm

long; leaflets 3–19, or the uppermost leaves simple, 3–20 mm long, 0.3–3 mm wide, linear, narrowly oblong, or ovate, strigose on both sides; peduncles 4–30 cm long; racemes loosely 5- to 30-flowered, the flowers spreading-declining at anthesis, the axis 3–28 cm long in fruit; bracts 0.5–3.2 mm long; pedicels 0.8–2.5 mm long; bracteoles 0; calyx 4.5–8 mm long, the tube 4–6.7 mm long, cylindric, strigose, purplish, the teeth 0.6–2.3 mm long, broadly subulate; flowers 12–19 mm long, pink-purple; pods pendulous, stipitate, the stipe 4–11 mm long, the body oblong to oblanceolate in outline, 19–35 mm long, 3–6 mm wide, strongly laterally flattened, glabrous, unilocular; ovules 14–20. Two allopatric and distinctive varieties of Colton milkvetch occur in Utah.

1. Leaves all odd-pinnate, with 9–19 leaflets, the terminal one jointed on all leaves; plants of Grand and San Juan cos. *A. coltonii* var. *moabensis*
- Leaves odd-pinnate, or the uppermost simple, with 3–9 leaflets, the terminal one continuous with the rachis; plants not from Grand or San Juan cos. *A. coltonii* var. *coltonii*

Var. *coltonii*. [*Homalobus coltonii* (M. E. Jones) Rydb.; *A. coltonii* var. *aphyllus* M. E. Jones, type from Richfield.]. Bunchgrass, salt desert shrub, pinyon-juniper, and mountain brush communities at 1470 to 2300 m in Carbon (type from Castle Gate), Emery, Garfield, Kane, Sevier, and Wayne cos.; endemic; 38 (ix).

Var. *moabensis* M. E. Jones. [*A. coltonii* var. *foliosus* M. E. Jones ex A. Eastwood; *Homalobus canovirens* Rydb., type from LaSal Mts.; *A. canovirens* (Rydb.) Barneby.]. Pinyon-juniper and less commonly mountain brush communities at 1400 to 2300 m in Grand and San Juan (type from Monticello) cos.; Colorado, New Mexico, and Arizona; 21 (viii).

***Astragalus consobrinus* (Barneby) Welsh** comb. nov. based on *A. castaneiformis* var. *consobrinus* Barneby Amer. Midl. Nat. 41: 496. 1949. Bicknell Milkvetch. Perennial, sometimes flowering the first year, acaulescent, 1–5 cm tall, the caudex branches obscured by persistent leaf bases and stipules; herbage malpighian; stems essentially lacking; stipules 3–7 mm long, all distinct; leaves 1–5 cm long; leaflets 3–11, 2–8 mm

long, 1.5–4.2 mm wide, obovate to oblanceolate or orbicular, rounded to obtuse or acute, strigose on both surfaces; peduncles 0.5–3 cm long; racemes 2- to 10-flowered, the flowers ascending at anthesis, the axis to 1 cm long in fruit; bracts 1.5–3.5 mm long; pedicels 1–2 mm long; bracteoles 0; calyx 5.5–8.9 mm long, the tube 4.1–6.8 mm long, cylindric, strigose, the teeth 1.4–1.7 mm long, subulate; flowers 10–15.5 mm long, ochroleucous suffused with purple; pods ascending, sessile, obliquely ovoid or lance-ovoid, 11–19 mm long, 3–8 mm thick, strigose, unilocular; ovules 18–33. Sagebrush-grasslands and pinyon-juniper communities at 1830 to 2200 m in Emery, Garfield, Piute, Sevier, and Wayne cos.; endemic. The Bicknell milkvetch has been compared with and treated within an expanded *A. castaneiformis*, with which it is similar in some salient morphological features. The similarity appears to be at least in part coincidental, and the true relationship of the Bicknell plants might lie with *A. cymboides* with which it is apparently allied. In any event, it seems best to treat *A. consobrinus* at specific level; 7 (v).

Astragalus convallarius Greene. Lesser Rushy Milkvetch. Perennial, caulescent, 10-60 cm tall, from a subterranean caudex; pubescence basifixed; stems erect or ascending; stipules 2-7 mm long, at least the lowermost connate-sheathing; leaves 2-11 cm long; leaflets, when present, 3-13, the uppermost leaves reduced to the rachis, mostly 5-30 mm long, 0.5-4 mm wide, linear to oblong or oblanceolate; peduncles 1-14 cm long; racemes 3- to 25-flowered, the flowers ascending to declined at anthesis, the axis 2-20 cm long in fruit; bracts 0.5-2.3 mm long; pedicels 1-8 mm long;

bracteoles 0-2; calyx 4-6.3 mm long, the tube 3.4-5.4 mm long, campanulate, black strigose, the teeth 0.5-1.4 mm long, triangular-subulate; flowers 6.5-12 mm long, ochroleucous or variously tinged or veined with purple; pods pendulous to spreading, sessile, linear to narrowly oblong, straight, 13-50 mm long, 2.3-4 mm thick, laterally compressed, strigose, unilocular; ovules 11-26. This is possibly the most widespread of the milkvetch species within Utah, definitely known from all but two counties. Two allopatric varieties are present.

1. Pods 25-50 mm long, 2.3-3.3 mm wide; plants widespread but not in western Iron and Washington cos. *A. convallarius* var. *convallarius*
- Pods 13-26 mm long, 3.4-4 mm wide; plants of western Iron and Washington cos. *A. convallarius* var. *finitimus*

Var. *convallarius*. [*Homalobus campestris* Nutt. ex Torr. & Gray; *Tragacantha campestris* (Nutt.) Kuntze; *A. serotinus* var. *campestris* (Nutt.) M. E. Jones *Phaca convallaria* (Nutt.) Greene; *H. junceus* Nutt. ex Torr. & Gray; *A. junceus* (Nutt.) A. Gray, not Ledeb. ex Spreng.; *T. juncea* (Nutt.) Kuntze; *A. diversifolius* var. *junceus* (Nutt.) M. E. Jones; *A. diversifolius* var. *roborum* M. E. Jones; *A. junciformis* A. Nels.; *H. junciformis* (A. Nels.) Rydb.; *A. junceus* var. *attenuatus* M. E. Jones, type from Price]. Mixed desert shrub, sagebrush, pinyon-juniper, mountain brush, ponderosa pine, and aspen communities at 1400 to 2900 m in all except Grand and Rich cos., and likely there also; Idaho and Montana south to Nevada and Colorado; 139 (xxiv).

Var. *finitimus* Barneby. Pinyon-juniper and sagebrush communities at 1700 to 2270 m in western Iron and Washington cos.; Lincoln Co., Nevada; 7 (ii).

***Astragalus cottamii* Welsh.** Cottam Milkvetch. Perennial, sometimes flowering the first year, acaulescent or subacaulescent, 1.2-8 cm tall, from a branching caudex; pubescence basifixed; stems lacking, or 0.5-6 cm long, the internodes mostly obscured by stipules; stipules 2-6 mm long, all distinct; leaves 1.2-8 cm long; leaflets (5) 9-19 (21), 2-9 mm long, 1-4.2 mm wide,

elliptic to oval or oblanceolate, acute to obtuse, strigose on both sides or glabrate above; peduncles 0.7-7 cm long; racemes 3- to 9-flowered, the flowers ascending at anthesis, the axis 0.5-2 cm long in fruit; bracteoles 0-2; calyx 6.2-8 mm long, the tube 4.8-6.7 mm long, cylindric, strigulose, purplish, the teeth 1.2-2 mm long, subulate; flowers 11-17 mm long, pink-purplish or bicolored; pods spreading-descending, sessile, curved, oblong to oblong-lanceolate in outline, triquetrous, the dorsal suture sulcate, bilocular, strigose, usually purple-blotched. Rimrock and ledges of Cedar Mesa, Kayenta, and Entrada sandstones, and in the sandy canyons cut from them in pinyon-juniper woods and blackbrush at 1300 to 1400 m in San Juan Co.; Navajo Co., Arizona. The Cottam milkvetch was not distinguished among the limited collections available to Barneby (1964), where the few specimens were thought to represent a portion of the range variability within *A. monumentalis*. The rather larger set currently available allows segregation on the basis of easily discernible diagnostic features of flowers and fruit; 11 (ix).

***Astragalus cronquistii* Barneby.** Cronquist Milkvetch. Perennial, caulescent 1.5-4 cm long, from a subterranean caudex; pubescence basifixed; stems decumbent-

ascending; stipules 2–6 mm long, all distinct; leaves 1.5–4.5 cm long; leaflets 7–15, 6–23 mm long, 1.5–4 mm wide, oblong to narrowly elliptic, retuse to truncate, strigose beneath, glabrate above; peduncles 2–6.5 cm long; racemes 6- to 20-flowered, the flowers declined at anthesis, the axis 1.5–8.5 cm long in fruit; bracts 0.6–1.2 mm long; pedicels 1.5–2.5 mm long; bracteoles 0; calyx 3.8–5.3 mm long, the tube 3.3–4 mm long, campanulate, strigose, the teeth 0.5–1.3 mm long, triangular; flowers 8–9 mm long, pink-purple; pods declined-pendulous, sessile or subsessile, the body narrowly elliptic to oblanceolate in outline, 13–30 mm long, 3–4.8 mm wide, trigonous, grooved dorsally, strigose, semibilocular. Blackbrush community, on Cutler Formation, at 1430 m in San Juan Co.; endemic; 4 (ii).

Astragalus cymboides M. E. Jones. Canoe Milkvetch. [*Xylophacos cymboides* (M. E. Jones) Rydb.; *A. amphioxys* var. *cymbellus* M. E. Jones]. Perennial, acaulescent or subacaulescent, 2.5–8 cm tall, from a simple or branched caudex; pubescence malpighian; stems lacking or 0.5–3 cm long, the internodes mostly obscured by stipules; stipules 3–8 mm long, all distinct; leaves 2.5–8 cm long; leaflets (1–3) 5–13, 3–13 mm long, 2–9 mm wide, obovate, elliptic or oblanceolate, obtuse to acute, pubescent on both surfaces; peduncles 2–8 cm long; racemes 3- to 9-flowered, the flowers ascending at anthesis, the axis 0.5–2 cm long in fruit; bracts 1–4 mm long; pedicels 0.7–2.5 mm long; bracteoles 0; calyx 7.6–10.2 mm long, the tube 5.9–8 mm long, cylindric, strigose, the teeth 1–2.3 mm long, subulate; flowers 15–18.5 mm long, ochroleucous or suffused purplish, or pink-purple; pods ascending, sessile, oblong to oblong-elliptic in outline, straight, 17–30 mm long, 6–9.5 mm wide, laterally compressed, the valves stiffly papery or cellular-spongy, the exocarp in time exfoliating, strigose, unilocular; ovules 39–57. Salt desert shrub and pinyon-juniper communities at 1600 to 2300 m in Carbon, Emery, and Grand cos.; endemic. The small-flowered phases of canoe milkvetch approach *A. consobrinus* and the large-flowered phases are difficult to dis-

tinguish from *A. amphioxys*. Further work is indicated; 36 (vii).

Astragalus desereticus Barneby. Deseret Milkvetch. Perennial, acaulescent or subacaulescent, 4–11 cm tall, from a caudex; pubescence basifixed; stems to 5 cm long, the nodes mostly obscured by stipules; stipules 3.5–7 mm long, all distinct; leaves 4–11 cm long; leaflets 11–17, 2–10 mm long, elliptic to obovate, short-acuminate to acute, strigulose-villosulous on both sides; peduncles 2–5.5 cm long; racemes 5- to 10-flowered, the flowers ascending at anthesis, the axis 0.5–2 cm long in fruit; bracts 3–6 mm long; pedicels 2–3 mm long; bracteoles 0–2; calyx 8.4–11.5 mm long, the tube 6.2–7.5 mm long, cylindric, villous, the teeth 2–4 mm long, subulate; flowers 18–22.5 mm long, ochroleucous (?), the keel purple-tipped; pods ascending, sessile or substipitate, ovoid-ellipsoid, curved, 10–12 mm long, 4–5 mm thick, densely hirsute with lustrous hairs; ovules 14–16. Sagebrush or pinyon-juniper communities at 1830 to 2000 m at Indianola, Sanpete Co.; endemic. This is an obscure taxon, apparently with affinities to *A. argophyllus* var. *martinii*, but differing in its densely long-hirsute and small pods. The Deseret milkvetch differs further in its more strongly graduated petals (banner 18–22.5 mm, but the keel 12–13.3 mm long). More material is necessary to make adequate predictions as to the true nature of this entity. It has not been collected in more than half a century; 1 (0).

Astragalus desperatus M. E. Jones. Rimrock Milkvetch. [*Batidophaca desperata* (M. E. Jones) Rydb.; *Tium desperatum* (M. E. Jones) Rydb.; *A. desperatus* var. *petrophilus* M. E. Jones, type from San Rafael Swell; *B. petrophila* (M. E. Jones) Rydb.]. Perennial, acaulescent or subacaulescent, 1–12 cm tall, from a branching caudex; pubescence basifixed; stems to 8 cm long, the internodes often obscured by stipules; stipules 1.5–7 mm long, at least some connate-sheathing; leaves 1–12 cm long; leaflets 7–17, 2–13 mm long, 1–5 mm wide, elliptic to oblanceolate or obovate, acute to obtuse, strigose on both sides or glabrate above; peduncles 0.5–13 cm long; racemes 3- to 18-flowered, the flowers ascending to declined at anthesis,

the axis 0.4–1.3 cm long in fruit; bracts 1.5–5 mm long; pedicels 0.5–1.4 mm long; bracteoles 0–2; calyx 3.5–6 mm long, the tube 2.5–4 mm long, campanulate, strigose-pilose, the teeth 0.8–2.6 mm long, subulate; flowers 6–9 mm long, pink-purple or bicolored; pods declined to deflexed, sessile or short-stipitate, the stipe (gynophore) to 1.2 mm long, the body obliquely ovoid to lance-ellipsoid, curved, 6–19 mm long, 3–6 mm thick, hirsute with lustrous hairs, unilocular; ovules 16–28. Mixed desert shrub and pinyon-juniper communities, often on rimrock, at 1130 to 1900 m in Emery, Garfield, Grand, Kane, San Juan, and Wayne cos.; Colorado and Arizona; Colorado Plateau endemic. There is some variation within *A. desperatus*. The deep pink-purple, small flowers with dark purplish calyces displayed by plants of the interior and northern half of the San Rafael Swell are the most distinctive of the variant types. These apparently form the basis of var. *petrophila* M. E. Jones. Further collections might demonstrate the necessity for recognition of that variety; 66 (xxi).

Astragalus detritalis M. E. Jones. Debris Milkvetch. [*Homalobus detritalis* (M. E. Jones) Rydb.; *A. spectabilis* C. L. Porter, not Schischk., the type from southwest of Vernal]. Perennial, acaulescent, 0.5–8 cm long, from a branching caudex; pubescence malpighian; stems essentially lacking; stipules 3–10 mm long, at least some (usually all) connate-sheathing; leaves 0.5–8 cm long, simple or leaflets 3–7, 3–30 mm long, and 0.5–2.5 mm wide, narrowly oblanceolate to linear, spinulose-tipped, strigose on both sides; peduncles 1–9 cm long; racemes 2- to 8-flowered, the flowers ascending at anthesis, the axis 0.2–3.8 cm long; bracts 2.5–7 mm long; pedicels 0.5–2.5 mm long; bracteoles 0–2; calyx 5–9.6 mm long, the tube 3.1–5.4 mm long, campanulate, strigose, the teeth 1.6–4.7 mm long, subulate; flowers 13–20 mm long, pink-purple; pods erect to steeply ascending, sessile, narrowly oblong, straight to curved, 15–38 mm long, 2–3.5 mm wide, laterally compressed, mottled, strigose, unilocular; ovules 15–24. Pinyon-juniper and mixed desert shrub communities at 1650 to 1950 m in Duchesne (type from

southwest of Duchesne) and Uintah cos.; Rio Blanco Co., Colorado; a Unita Basin endemic; 10 (ii).

Astragalus diversifolius A. Gray. Meadow Milkvetch. [*Homalobus orthocarpus* Nutt. ex Torr. & Gray, not Boiss.; *A. campestris* var. *diversifolius* (A. Gray) Macbr.; *A. junceus* var. *orthocarpus* (Nutt.) M. E. Jones; *A. junceus* var. *diversifolius* (A. Gray) M. E. Jones; *A. convallarius* var. *diversifolius* (A. Gray) Tidestr.; *A. ibapensis* M. E. Jones; *Atelophragma ibapense* (M. E. Jones) Rydb.]. Perennial, caulescent, 20–50 cm long, from a subterranean to superficial caudex; pubescence basifixed; stems prostrate to ascending; stipules 1–3 mm long, the lowest connate-sheathing; leaves 1.5–7 cm long; leaflets 1–7, 4–47 (67) mm long, narrowly elliptic, linear, oblanceolate or lanceolate, the uppermost often simple, strigose on both sides; peduncles 2–15 cm long; racemes 3- to 8-flowered, the flowers ascending at anthesis, the axis 0.5–3 mm long in fruit; bracts 0.7–2.5 mm long; pedicels 1.8–4 mm long; bracteoles 0; calyx 4.4–6.7 mm long, the tube 3.2–4.7 mm long, campanulate, strigose, the teeth 1–2 mm long, subulate; flowers 8–13.5 mm long, greenish-white, often tinged with purple; pods ascending to declined, sessile or substipitate, the body narrowly oblong, 10–17 mm long, 2.7–4 mm wide, strongly compressed, strigose, unilocular; ovules 10–16. Moist, often saline, meadows at 1340 to 1700 m in Juab (Juab, Goodding 1084, GH, NY, US, June 10, 1902), and Tooele (type of *A. ibapensis* from Deep Creek Mts., M. E. Jones s.n., 23 June 1891, POM); Idaho. This is a poorly known entity in Utah, and it is not known from recent collections. Possibly it is extinct in Utah; 1 (0).

Astragalus drummondii Douglas ex Hook. Drummond Milkvetch. [*Tragacantha drummondii* (Douglas) Kuntze; *Tium drummondii* (Douglas) Rydb.]. Perennial, caulescent, 25–60 cm tall, from a branching subterranean caudex; pubescence basifixed; stems erect or ascending; stipules 3–12 mm long, at least some connate-sheathing; leaves 4–13 cm long; leaflets 17–33, 4–33 mm long, 2–12 mm wide, oblong to oblanceolate or obovate, obtuse to truncate or

emarginate, villous-pilose beneath, usually glabrous above; peduncles 4–12 cm long; racemes 14- to 30-flowered, the flowers spreading-declined at anthesis, the axis 3–22 cm long in fruit; bracts 2–5 mm long; pedicels 1.5–5 mm long; bracteoles 0–2; calyx 7–12.5 mm long, the tube 4.7–8 mm long, short-cylindric, sparingly villous, the teeth 1.7–4.5 mm long, subulate; flowers 18–26 mm long, whitish to ochroleucous, the keel purple-tipped; pods pendulous, stipitate, the stipe 5–11 mm long, the body narrowly oblong to oblanceolate in outline, 17–32 mm long, 3.5–5.5 mm thick, trigonous, sulcate dorsally, glabrous, bilocular; ovules 14–30. Pinyon-juniper, ponderosa pine, and mountain brush communities at 1530 to 2130 m in Beaver, Sevier, and Utah cos.; Alberta and Saskatchewan south to New Mexico; 12 (ii).

Astragalus duchesnensis M. E. Jones. Duchesne Milkvetch. [*Lonchophaca duchesnensis* (M. E. Jones) Rydb.]. Perennial, caulescent, 15–35 cm tall, from a branching caudex; pubescence basifixed; stems straggling to ascending or erect; stipules 3–8 mm long, all distinct; leaves 2–10 cm long; leaflets 5–15, 3–20 mm long, 0.5–3 mm wide, linear to oblong or narrowly oblanceolate, obtuse to retuse, strigose on both sides or glabrate above, the uppermost leaflet sometimes continuous with the rachis; peduncles 3–10.5 cm long; racemes 6- to 22-flowered, the flowers ascending at anthesis, the axis 2.5–12 cm long in fruit; bracts 0.7–2 mm long; pedicels 0.8–2.2 mm long; bracteoles 0; calyx 3.6–5.5 mm long, the tube 3.1–4.3 mm long, campanulate, usually purple, the teeth 0.4–1 mm long, triangular; flowers 8.5–12.5 mm long, pink-purple with white wing-tips; pods declined sessile, oblong to narrowly oblanceolate in outline, 20–35 mm long, 3.3–5 mm thick, dorsiventrally compressed in the lower half, becoming laterally compressed in the distal portion, strigose, unilocular; ovules 21–31. Sand to heavy clay soils in mixed desert shrub and pinyon-juniper communities at 1450 to 1750 m in Duchesne and Uintah cos., endemic; 7 (ii).

Astragalus eastwoodae M. E. Jones. Eastwood Milkvetch. [*A. preussii* var. *sulcatus*

M. E. Jones; *Phaca eastwoodae* (M. E. Jones) Rydb.; *A. preussii* var. *eastwoodae* (M. E. Jones) M. E. Jones.]. Perennial, short caulescent, 8–20 cm tall, from a branching caudex; pubescence lacking except on calyx, basifixed; stems 2–14 cm long, decumbent to ascending; stipules 2–6.5 mm long, all distinct; leaves 3–13 cm long; leaflets 13–25, 1–15 mm long, 1–5 mm broad, elliptic to lance-elliptic, oblanceolate or obovate, obtuse to truncate-emarginate, glabrous; peduncles 2–10.5 cm long; bracts 1.5–4.5 mm long; pedicels 1.5–3.5 mm long; bracteoles 2; calyx 10–12.2 mm long, the tube 8–9.5 mm long, cylindric, purple, sparsely black-strigose, the teeth 1.3–2.7 mm long, subulate; flowers 18–22 mm long, pink-purple; pods spreading to declined, stipitate, the stipe 1.5–4.5 mm long, the inflated body oblong-ellipsoid, 14–26 mm long, 7–14.5 mm thick, the valves papery and straw-colored, unilocular, glabrous; ovules 20–38. Mixed desert shrub and pinyon-juniper communities at 1330 to 1830 m in seleniferous soils in Emery, Grand, San Juan, and Wayne cos.; Colorado. The Eastwood milkvetch is closely allied to *A. preussii*. It differs mainly in the shorter stems and spreading-descending, thin-textured pods; 6 (ii).

Astragalus emoryanus (Rydb.) Cory. Emory Milkvetch. [*Hamosa emoryana* Rydb.]. Annual or winter annual, caulescent, 4–45 cm long, from a slender taproot; pubescence basifixed; stems prostrate; stipules 1.5–3.6 mm long, all distinct; leaves 1–4.5 cm long; leaflets 11–19, 2–10 mm long, 1–6 mm wide, oval-obovate to obcordate or oblanceolate, obtuse to retuse on all leaves, sparingly strigose on both sides or glabrate above; peduncles 2–6 cm long; racemes 2- to 10-flowered, the flowers spreading at anthesis, the axis 0.3–2.5 cm long in fruit; bracts 0.5–2 mm long; bracteoles 0; calyx 3.6–6 mm long, the tube 1.9–3.5 mm long, campanulate, strigose, the teeth 1.3–2.5 mm long; flowers 7.3–11 mm long, pink-purple; pods declined to ascending, sessile, narrowly oblong, curved, 0.8–2.2 cm long, 2.2–4.3 mm wide, trigonous, glabrous, bilocular; ovules 10–16. Pinyon-juniper community at 1700 m in Kane Co. (Cockscomb); Arizona,

New Mexico, Texas, and Mexico. This is an obscure entity in Utah. It is very similar in most salient features with *A. nuttallianus*, from which it can be distinguished by the deciduous, straw-colored pods, merely strigose calyx teeth, retuse-obtuse leaflets on all leaves, and rounded keel-tip. This latter feature is shared with *A. nuttallianus* var. *micranthiformis*, but that entity is known to occur in Kane Co. only east of the Cockscomb; 1 (0).

Astragalus ensiformis M. E. Jones. Pargump Milkvetch. [*A. ursinus* M. E. Jones, not A. Gray; *Hamosa ensiformis* (M. E. Jones) Rydb.; *A. ensiformis* var. *gracilior* Barneby; *A. minthorniae* var. *gracilior* (Barneby) Barneby.]. Perennial, caulescent, 8–45 cm tall, from a superficial to subterranean caudex; pubescence basifixed; stems decumbent to erect; stipules 4–10 mm long, all distinct; leaves 4–15.5 cm long; leaflets (5) 11–23, 6–24 mm long, 1.5–13.5 mm wide, ovate to oblong, obovate, or oblanceolate, obtuse to retuse, strigose (sometimes sparsely so) beneath, strigose to glabrous above; peduncles 2.5–13 cm long; racemes 12- to 30-flowered, the flowers ascending to declined at anthesis, the axis 3.5–13.5 cm long in fruit; bracts 2–6 mm long; pedicels 1–3.5 mm long; bracteoles 0–2; calyx 5.2–7.8 mm long, the tube 4.5–6.5 mm long; short-cylindric, pilosulose with black hairs, the teeth 1.2–2.5 mm long, subulate; flowers 13–17 mm long, purplish to pink-purple, the wing-tips pale to white; pods ascending to descending, sessile or substipitate, the body narrowly oblong, curved, 15–30 mm long, 4–6 mm thick, subterete (compressed laterally when pressed), bilocular, strigose to strigulose; ovules 24–36. Pinyon-juniper, sagebrush, and blackbrush-larrea communities at 1230 to 2350 m in Washington Co.; Mohave Co., Arizona. The materials included herein as portions of an expanded *A. ensiformis* have been treated as belonging to *A. ensiformis* sens. str. and to *A. ensiformis* or *A. minthorniae* as var. *gracilior*. The var. *gracilior* was named by Barneby (Calif. Acad. Sci. Proc. 25:158. 1944) as a variety of *A. ensiformis* on the basis of plants taken near Veyo. Later Barneby (Amer. Midl. Naturalist 55:493. 1956)

transferred the variety to *A. minthorniae* (Rydb.) Jeps. The var. *gracilior* is supposed to differ from *A. ensiformis* sens. str. by its erect (not short decumbent) stems, reflexed pedicels (not spreading-ascending), and by the sparingly long strigose (not shortly pilosulous) essentially pendulous (not ascending to erect) pods. With a rather substantial number of specimens now available the supposed diagnostic criteria fail as differential features. Stems are decumbent to ascending or erect, varying with each separate population. Peduncle position does not appear to be taxonomically important because of lack of correlation with other features. The position of the fruit is likewise not correlated with other characteristics. Pubescence size and shape forms a continuum. The final features, involving the pods, are tenuous at best and almost impossible to demonstrate at worst. Each sub-population varies, the whole consisting of apparent recombination types, with *A. ensiformis* sens. str. the extreme in one series and var. *gracilior*, the extreme in another. Thus, *A. ensiformis* is treated herein as consisting of a series of polymorphic populations, not readily separable into infraspecific taxa. The status of *A. minthorniae*, shorn of this taxon, is beyond the scope of this work; 18 (iv).

Astragalus episcopus S. Wats. Bishop Milkvetch. [*Tragacantha episcopa* (S. Wats.) Kuntze; *Homalobus episcopus* (S. Wats.) Rydb.; *A. kaibensis* M. E. Jones; *Lonchophaca kaibensis* (M. E. Jones) Rydb.]. Perennial, caulescent, rush-like, 20–45 cm tall arising from a subterranean caudex; pubescence basifixed; stems erect or ascending; stipules 2–13 mm long, all distinct; leaves 2–10 cm long, most of them reduced to the rachis, some with leaflets 3–13 in number, the leaflets 1–15 mm long, 0.5–2 mm wide, linear to elliptic or oblong, acute to obtuse or emarginate, strigose on both sides; peduncles 6–23 cm long; racemes very loosely 6- to 30-flowered, the flowers ascending in anthesis, the axis 3–30 cm long in fruit; bracts 1.3–3 mm long; pedicels 1.5–3.5 mm long; bracteoles 0–2; calyx 4.1–7 mm long, the tube 3.4–5.2 (6) mm long, short cylindric, always much longer than broad, suffused purplish or very pale, white-strigose,

the teeth 0.6–2.2 mm long, triangular to subulate; flowers 10–15.5 mm long, pale pink or whitish to pink-purple; pods pendulous, sessile or subsessile, the body oblong to lance-elliptic in outline, slightly curved to straight, 14–32 mm long, 4–8 mm wide, laterally compressed, glabrous to strigose, straw-colored or tinged or mottled purple, unilocular; ovules 16–26. Mixed desert shrub and pinyon-juniper communities often in clay or silty soils at 1270 to 1700 m in Emery, Garfield, Kane, and Wayne cos. (type from southern Utah); Arizona. The Bishop milkvetch closely simulates *A. lancearius* q.v., with which it is sympatric in Kane Co. and in Arizona. The calyx of *A. lancearius* is black-strigose, not or seldom suffused with purple, with the tube campanulate and as broad as long or only somewhat longer than broad, and the flowers are broader in proportion to length than in *A. episcopus*; 38 (xii).

Astragalus eremiticus Sheldon. Hermit Milkvetch. [*A. arrectus* var. *eremiticus* (Sheldon) M. E. Jones]. Perennial, caulescent, 20–45 cm tall, from a branching commonly superficial caudex; pubescence basifixed; stems erect or ascending; stipules 3–11 mm long, 1.5–12 mm wide, ovate to oblong, elliptic, or narrowly oblong, obtuse to retuse, strigose beneath, glabrate to glabrous above; peduncles 2.5–15 cm long; racemes 10- to 26-flowered, the flowers ascending to declined at anthesis, the axis 5–17 cm long in fruit; bracts 1.5–4 mm long; pedicels 0.7–3.5 mm long; bracteoles 0–2; calyx 4.5–8.7 mm long, the tube 4–6.8 mm long, short-cylindric, strigose, the teeth 0.7–2 mm long, triangular to subulate; flowers 12–18 mm long, ochroleucous, pink-purple, or merely tinged purplish; pods erect, stipitate, the stipe 6–15 mm long, the body oblong to ellipsoid or obliquely ellipsoid, 12–27 mm long, 3.5–8 mm thick, trigonous, glabrous, bilocular; ovules 17–32. Juniper-pinyon, live oak, and sagebrush communities at 1130 to 1830 m in Kane (west of Cockscomb) and Washington cos.; Arizona, Nevada, and Idaho. Plants with inflated and proportionately shorter pod bodies simulate the rare *A. ampullarius* which occupies clay soils at lower elevations; 13 (i).

Astragalus eucosmus B. L. Robins. Elegant Milkvetch. [*A. oroboides* var. *americanus* A. Gray, not *A. americanus* (Hook.) M. E. Jones; *Phaca elegans* Hook.; *A. elegans* (Hook.) Sheldon, not Bunge; *Atelophragma elegans* (Hook.) Rydb.]. Perennial, caulescent, 10–40 cm long, from a branching caudex; pubescence basifixed; stems erect to ascending; stipules 1.5–6 mm long, at least some of the lower ones usually connate-sheathing; leaves 2–10 cm long; leaflets 9–15, 10–22 mm long, 4–7 mm broad, obtuse, strigose beneath, glabrous or glabrate above; peduncles 5–18 cm long; racemes 7- to 25-flowered, the flowers declined at anthesis, the axis 3.5–15 cm long in fruit; bracts 1–3.5 mm long; pedicels 0.5–3 mm long; bracteoles usually 0; calyx 3.3–5.4 mm long, the tube 2.5–3.5 mm long, campanulate, strigulose, the teeth 0.9–1.6 mm long, subulate; flowers 6–8 mm long, purple or whitish; pods spreading to deflexed, sessile or subsessile, 8–12 mm long, 2.5–5 mm thick; laterally compressed, pilose, semibilocular; ovules 4–8. Woods, rare, north slope of Uinta Mountains, Summit Co., Utah; Alaska east to Nova Scotia and south to Colorado and Maine; 1 (0).

Astragalus eurekensis M. E. Jones. Eureka Milkvetch. [*Xylophacos eurekensis* (M. E. Jones) Rydb.]. Perennial, acaulescent, 2–15 cm tall, the caudex branches obscured by persistent leaf bases; pubescence basifixed; stipules 3–11 mm long, all distinct; leaves 2–15 cm long; leaflets (3) 5–19, 3–35 mm long, 2–8 mm wide, elliptic to oblong, acute, gray or silvery strigose on both surfaces; peduncles 1–13 cm long, pilose; racemes 3- to 7-flowered, the flowers ascending at anthesis, the axis 0.2–2 cm long in fruit; bracts 4–8 mm long; pedicels 1.2–3 mm long; calyx 10.5–15.5 mm long, the tube 8.5–10.5 mm long, cylindric, pilose-villous, the teeth 2.5–5.7 mm long, subulate; flowers 22–27 mm long, ochroleucous, faintly to strongly suffused with purple or rarely pink-purple; pods ascending, sessile, obliquely lance-ovoid, 15–40 mm long, 5–9 mm thick, villous-hirsute, unilocular; ovules 26–36. Sagebrush, pinyon-juniper, and mountain brush communities at 1370 to 2135 m in Beaver, Garfield, Iron, Juab, Mil-

lard, Sanpete, Sevier, Tooele, Utah, and Wasatch cos.; endemic. When, as rarely, the flower color is bright pink-purple this entity, lacking fruit, is exceedingly difficult to separate from *A. newberryi* (q.v.); 51 (xiv).

Astragalus falcatus Lam. Russian Sickle Milkvetch. Perennial, caulescent, 40–90 cm tall, from a branching caudex; pubescence malpighian; stems ascending to erect, forming large clumps; stipules 2–12 mm long, at least some connate-sheathing; leaves 5–22 cm long; leaflets 19–37, 6–35 mm long, 1.5–10 mm wide oblong to elliptic or oblanceolate, acute to apiculate, strigose below, glabrous above, green on both sides; peduncles 6–17 cm long; racemes 20- to 70-flowered, the flowers delined at anthesis, the axis 3–20 cm long in fruit; bracts 2–5 mm long; pedicels 2–5 mm long, recurved in fruit; bracteoles 2; calyx 3.6–4.7 mm long, the tube 3–3.5 mm long campanulate, strigose, the teeth 0.5–1.2 mm long, triangular; flower 9–11 mm long, greenish-white, sometimes suffused with purple; pods decurved, subsessile, curved-oblong, 13–23 mm long, 2.5–4.5 cm wide, triangular, strigulose, bilocular, ovules 12–14. Introduced soil stabilization plant, established in Juab Co., and to be expected elsewhere in Utah;

southeastern Europe. This is a robust perennial capable of surviving in harsh, heavy soils in the mountain brush zone of the state; 2 (ii).

Astragalus flavus Nutt. ex Torr & Gray. Yellow Milkvetch. Perennial, caulescent, 5–30 cm tall, from a branching caudex; pubescence malpighian; stems decumbent to ascending or erect; stipules 2–10 mm long, all connate-sheathing; leaves 3–15 (18) cm long; leaflets (5) 9–21, 3–31 mm long, 0.5–6 mm wide, linear, narrowly oblong, or oblanceolate to ovate, obtuse to acute, silvery strigose (greenish) on both sides or glabrate to glabrous above; peduncles 3–23 cm long; racemes 6- to 30-flowered, the flowers ascending at anthesis, the axis 2–12 cm long in fruit; bracts 1.5–5 mm long; pedicels 0.7–1.2 mm long; bracteoles 0; calyx 5.5–9.5 mm long, the tube 3–5.2 mm long, campanulate, strigose to pilose, the teeth 2–6 mm long, subulate; flowers 9–17 mm long, yellow to ochroleucous, whitish, lilac, or pink-purple; pods erect, sessile, oblong, 7–13 mm long, 3.5–5 mm thick, straight, dorsiventrally compressed, strigose, unilocular; ovules 6–17. Three more or less distinctive varieties, all primary selenophytes, are present in Utah.

1. Calyx shaggy long villous, the teeth 3–6 mm long, equaling or longer than the tube; flowers pink-purple; plants of Emery, Grand, Wayne, and Garfield cos. *A. flavus* var. *argillosus*
- Calyx strigose to short villous, the teeth 2–3 (4) mm long, shorter than the tube; flowers yellow to white or tinged purplish, rarely pink-purple; plants of various distribution 2
- 2(1). Flowers whitish or yellowish, sometimes tinged with purple, rarely pink-purple; keel 6–8 mm long; plants from central and southern counties *A. flavus* var. *candicans*
- Flowers cream to yellow; keel 8–10 mm long; plants from east-central to northeastern Utah *A. flavus* var. *flavus*

Var. *argillosus* (M. E. Jones) Barneby. [*A. argillosus* Jones; *Cnemidophacos argillosus* (M. E. Jones) Rydb.] Mancos Shale, Summerville, Cedar Mountain, and Morrison formations, on saline clays and silts with salt desert shrubs at 1230 to 1600 m in Emery (type from Green River), Garfield, Grand, and Wayne cos.; endemic; 23 (vi).

Var. *candicans* A. Gray. [*A. confertiflorus* A. Gray, type from near St. George; *Cnemidophacos confertiflorus* (A. Gray) Rydb.]. Mancos and Tropic shales, Moenkopi, Chinle, and Kaiparowits formations and other saline clays and silts at 900 to 2130 m in Garfield, Kane, San Juan, and Washington cos.; Arizona and Nevada. The var. *candi-*

cans passes into var. *flavus* in central eastern Utah; 43 (vii).

Var. *flavus*. [*Cnemidophacos flavus* (Nutt.) Rydb.; *Tragacantha flaviflora* Kuntze; *A. confertiflorus* var. *flaviflorus* (Kuntze) M. E. Jones]. Mancos Shale, Chinle, Moenkopi, Duchesne River, Uinta, and other formations composed of saline silts and clays in salt desert shrub and pinyon-juniper communities at 1230 to 1730 m in Carbon, Daggett, Duchesne, Emery, Grand, San Juan, Sanpete, Sevier, and Uintah cos.; Arizona, New Mexico, Colorado, and Wyoming. Sheep poisoning attributable to var. *flavus* is known from the lower elevation portions of the Uinta Basin; 40 (xiii).

***Astragalus flexuosus* (Hook.) Don.** Perennial, caulescent, 10–60 cm tall, from a branching caudex; pubescence basifixed; stems decumbent or ascending; stipules 1–7 mm long, at east the lowermost connate-sheathing; leaves 1.5–9 cm long; leaflets (5)

9–25, 3–19 mm long, 1–8 mm wide, linear or oblong to oblanceolate or obovate, obtuse to truncate or retuse, strigose to glabrate beneath, usually glabrous above; peduncles 1.5–14 cm long; racemes 7- to 26-flowered, the flowers spreading at anthesis the axis 2.5–13 cm long in fruit; bracts 0.6–4.5 mm long; pedicels 0.7–3.5 mm long; bracteoles 0–2; calyx 3.3–5.8 mm long, the tube 2.4–4.3 mm long, campanulate, strigose, the teeth 0.5–1.7 mm long, subulate; flowers 7–11 mm long, pink-purple to dull purplish; pods descending to spreading, sessile or short-stipitate, the stipe 0.5–1.3 mm long, the body oblong to oblanceolate or elliptic in outline, 8–24 mm long, 2.7–4.8 mm thick, subterete or variously somewhat flattened, strigose to glabrous, unilocular; ovules 12–25. Two rather distinctive varieties are present, both confined to eastern Utah.

1. Calyx tube 2.4–2.7 mm long; pods sessile or nearly so; plants spreading-decumbent, in pinyon-juniper and mixed desert shrublands *A. flexuosus* var. *diehlii*
- Calyx tube 2.7–4.3 mm long; pods subsessile to shortly stipitate; plants of pinyon-juniper and mountain brush communities *A. flexuosus* var. *flexuosus*

Var. *diehlii* (M. E. Jones) Barneby. [*A. diehlii* M. E. Jones; *Phisophaca diehlii* (M. E. Jones) Rydb.]. Salt desert shrub and pinyon-juniper communities at 1370 to 1670 m in Carbon, Emery, Grand, and Uintah cos.; Colorado; 12 (vii).

Var. *flexuosus*. [*Phaca flexuosa* Hook.; *Homalobus flexuosus* (Hook.) Rydb.; *Pisophaca flexuosa* (Hook.) Rydb.]. Pinyon-juniper and mountain brush communities at 1675 to 2135 m in Grand and San Juan cos.; British Columbia east to Ontario and south to New Mexico, Nebraska, and Minnesota; 2 (0).

***Astragalus fucatus* Barneby.** Hopi Milk-vetch. [*A. subcinereus* sensu M. E. Jones, not Gray, q.v.]. Perennial, caulescent, 7–45 cm tall, from a subterranean to superficial caudex; pubescence basifixed; stems ascending to erect or sprawling; stipules 1–5.5 mm long, the lowest connate-sheathing; leaves 2–12.5 cm long; leaflets 9–17, 3–20 (25)

mm long, 0.5–2.5 mm wide, obtuse to retuse, strigose beneath, glabrous above; peduncles 1–6.5 cm long; racemes 9- to 22-flowered, the flowers ascending to declined at anthesis, the axis 2–11.5 cm long in fruit; bracts 0.8–2 mm long; pedicels 0.7–3.5 mm long; bracteoles 0; calyx 3.3–5.4 mm long, the tube 2.3–3.3 mm long, campanulate, strigose, the teeth 0.8–2.2 mm long; flowers 6.4–8.7 mm long, pink-purple; pods spreading to declined, sessile, bladdery-inflated, ovoid, ellipsoid or subglobose, 17–32 mm long, 12–20 mm wide (when pressed), mottled, strigose, unilocular; ovules 21–32. Mixed desert shrub communities, usually in sandy soil, at 1330 to 1830 m in Garfield and San Juan cos.; Colorado, New Mexico, and Arizona; 18 (iv).

***Astragalus geyeri* A. Gray.** Geyer Milk-vetch. [*Phaca annua* Geyer, not *A. annuus* DC.]. Annual (rarely biennial), caulescent, 6–27 cm long, from a slender taproot; pu-

bescence basifixed; stems prostrate to ascending or erect; stipules 1.5–4 mm long, all distinct; leaves 2–10.5 cm long; leaflets 3–13, 3–17 mm long, 1–5.2 mm wide, linear to oblong or narrowly elliptic, obtuse to retuse, strigose beneath and strigose to glabrous above; peduncles 0.6–1.5 cm long; racemes 2- to 8-flowered, the flowers ascending at anthesis, the axis 0.8–1.5 cm long in fruit; bracts 0.7–2 mm long; pedicels 0.6–1.5 mm long; bracteoles 0–1; calyx 2.7–3.8 mm long, the tube 1.6–2.4 mm long, campanulate, strigose, the teeth 0.6–1.5 mm long; flowers 5–7.6 mm long, pale, suffused with purple, or pink-purple; pods spreading to declined, bladderly-inflated, obliquely ovoid, 15–24 mm long, 6–12 mm wide (when pressed), strigose, unilocular; ovules 7–18. Sandy soil in mixed desert shrub communities at 1370 to 1830 m in Beaver, Daggett, Duchesne, Emery, Garfield, Grand, Juab, Millard, Salt Lake, Tooele, Uintah, and Wayne cos.; Oregon east to Wyoming and south to California, Nevada, and Colorado. Plants grown from seed in a greenhouse produced mature fruit and seeds in 58 days; 32 (iv).

***Astragalus gilviflorus* Sheldon.** Plains Orophaca. [*A. triphyllus* Pursh, not Pallas; *Tragacantha triphylla* (Pursh) Kuntze; *Orophaca triphylla* (Pursh) Britt; *Phaca caespitosa* Nutt., not *A. caespitosus* Pallas; *Phaca argophylla* Nutt., not *A. argophyllus* Nutt. ex Torr. & Gray.]. Perennial, acaulescent, 1.5–13 cm tall, from a branching caudex; pubescence malpighian; stems entirely obscured by stipules; stipules 6–18 mm long, connate-sheathing; leaves 1–13 cm long, palmately trifoliolate, the leaflets 7–20 mm long, 2–7 mm wide, spatulate to elliptic, acute to obtuse silvery strigose on both sides; peduncles obsolete; racemes capitate, 1- to 3-flowered, the flowers erect, the axis very short in fruit; bracts 4.5–7.6 mm long, tridentate; pedicels 0–1.6 mm long; bracteoles 0; calyx 9.3–18 mm long, the tube 10–14 mm long, cylindric, loosely villous, the teeth 1.6–4 mm long; flowers 17–28 mm long, whitish to ochroleucous; pods erect, sessile, ovoid-ellipsoid, 6–10 mm long, 2.5–5 mm thick, densely hairy, unilocular. Sagebrush community at about 2130 m in

Summit Co.; Alberta east to Ontario and south to Wyoming and Nebraska; 1 (0).

***Astragalus hallii* A. Gray.** Hall Milk-vetch. [*A. fallax* S. Wats.; *A. familiaris* Sheldon, not *A. fallax* Fischer; *A. gracilentus* var. *fallax* (S. Wats.) M. E. Jones; *Pisophaca familia* (Sheldon) Rydb.]. Perennial, caulescent, 12–50 cm tall, from a subterranean caudex; pubescence basifixed; stems decumbent to ascending or erect; stipules 1–7 mm long, at least the lowermost connate-sheathing; leaves 2–9 cm long; leaflets 11–23, 2–11 mm long, 1–7 mm wide, obovate to oblanceolate or elliptic, retuse to truncate or obtuse, strigulose beneath, sparingly hairy or glabrous above; peduncles 3–9.5 cm long; racemes 9- to 25-flowered, the flowers spreading-declined at anthesis, the axis 1–7 cm long in fruit; bracts 1.5–5 mm long; pedicels 1.2–4 mm long; bracteoles 0–2; calyx 6–7 mm long, the tube 5.2–6.2 mm long, short-cylindric, villosulous, the teeth 0.7–1.2 mm long, triangular; flowers 12.8–15 mm long, pink-purple; pods spreading to declined, short-stipitate, the stipe 1.5–3.5 mm long, the inflated body cylindroid to obliquely ovoid-ellipsoid, 19–27 mm long, 8–12 mm thick, strigulose, unilocular; ovules 20–37. Pinyon-juniper and mountain brush communities at 1600 to 2130 m in Garfield (?) and Kane cos.; Arizona and New Mexico. Our plants belong to var. *fallax* (S. Wats.) Barneby. They seem not to differ in any significant way from those of the Flagstaff Plateau in north-central Arizona; 3 (i).

***Astragalus hamiltonii* C. L. Porter.** Hamilton Milk-vetch. Perennial, caulescent, 25–60 cm long, from a shallowly subterranean caudex; pubescence basifixed; stems erect; stipules 1.5–9.5 mm long, all distinct or rarely some shortly connate-sheathing; leaves 3–8 cm long, the uppermost (and sometimes the lowermost) simple, the others with leaflets 3–7, 10–47 mm long, 2–7 mm wide, elliptic to narrowly oblanceolate, obtuse to retuse, strigose on both sides, the terminal leaflet continuous with the rachis; peduncles 2.5–15.5 cm long; racemes 7- to 30-flowered, the flowers spreading-declined at anthesis, the axis 2–11 cm long in fruit; bracts 1–2.5 mm long;

pedicels 1.2–3 mm long; bracteoles 0–2; calyx 8.2–11 mm long, light brown, the tube 6.5–9.2 mm long, cylindric, gibbous, strigose, the teeth 1.7–2.6 mm long, subulate; flowers 20–24 mm long, ochroleucous, concolorous; pods pendulous, stipitate, the stipe 9–12 mm long, the body ellipsoid, 25–35 mm long, 4–7.5 mm thick, dorsiventrally compressed, the valves often brownish, strigose, unilocular; ovules 16–22. Duchesne River and Wasatch formations at 1600 to 1770 m in the juniper-pinyon community of western Uintah Co.; endemic. This is a mirrored-image cogener of *A. lonchocarpus* (q.v.), which is not known from the Uinta Basin; 8 (iii).

***Astragalus harrisonii* Barneby.** Harrison Milkvetch. Perennial, caulescent, rush-like, 40–70 cm tall, from a subterranean caudex; pubescence basifixed; stems diffusely interbranched, in clumps to 1 m wide or more; stipules 1–5 mm long, all distinct; leaves 1.5–6.5 cm long, the uppermost simple, with the terminal leaflet expanded and confluent with the rachis, the others with leaflets 3–9, 2–11 mm long, 0.5–1.5 mm wide, linear-elliptic, acute, strigose on both sides; peduncles 6–19 cm long; racemes loosely 3- to 15-flowered, the flowers ascending at anthesis, the axis 5–40 cm long in fruit; bracts 0.5–1.1 mm long; pedicels 1.5–5.5 mm long; calyx 2.7–4.6 mm long, the tube 1.5–3.7 mm long, campanulate, strigose, the teeth 0.5–1.9 mm long, triangular; flowers 9–10.5 mm long, pink-purple; pods pendulous, stipitate, the stipe 3–4 mm long, the body narrowly ellipsoid, straight or curved, 17–28 mm long, dorsiventrally compressed, strigose to glabrous, unilocular; ovules 10–12. Pinyon-juniper community at 1650 m on Navajo Sandstone, Capitol Reef National Park, Wayne Co.; endemic. The Harrison milkvetch is a near cogener of *A. nidularius* (q.v.); 7 (iii).

***Astragalus henrimontanensis* Welsh, nom. nov.** based on *Astragalus stocksii* Welsh Great Basin Nat. 34:307. 1974, not *A. stocksii* Benth. ex Bunge Astragal. Geront. 1:6. 1868. Dana Milkvetch. Perennial, acaulescent, 4–15 cm tall, from a branching caudex, the branches clothed with coarse, persistent leaf bases; pubescence basifixed;

stipules 3–8 mm long, all distinct; leaves 2.7–12.5 cm long; leaflets 7–17, 3–13 mm long, 1.5–6 mm wide elliptic to oblanceolate, mucronate, acute to obtuse to truncate, strigose on both sides; peduncles 1.1–8 cm long; racemes 2- to 11-flowered, the flowers ascending at anthesis, the axis 0.3–2.2 cm long in fruit; bracts 1.8–5.5 mm long; pedicels 1.3–2.5 mm long; bracteoles 0–2; calyx 10.2–15 mm long, the tube 8.2–11.5 mm long, cylindric, strigulose, the teeth 1.9–3.5 mm long, subulate; flowers 15–23 mm long, ochroleucous, the wings and keel purple-tipped; pods ascending, sessile, lance-ovoid, slightly incurved, 22–35 mm long, 5–11 mm thick, somewhat dorsiventrally compressed, strigose, unilocular. Ponderosa pine, pinyon-juniper, and sagebrush communities at about 2430 m in the Henry Mountains, Garfield Co.; endemic. The Dana Milkvetch was named to honor Dana L. Stocks, late chairman of the Department of Botany at Brigham Young University. The species combines features of *A. argophyllus* var. *panguicensis*, as to pod shape and pubescence, and of *A. eurekaensis*, as to habit and flower color; 11 (iv).

***Astragalus humistratus* A. Gray.** Ground-cover Milkvetch. [*Batiadophaca humicagens* Rydb.]. Perennial, caulescent, 7–80 cm long, radiating from a caudex; pubescence malpighian; stems prostrate; stipules 2–9 mm long, 0.5–6 mm wide, elliptic to oblong or oblanceolate, acute, strigose on both sides or glabrate above; peduncles 2–9 cm long; racemes 3- to 20-flowered, the flowers ascending at anthesis, the axis 1–12 cm long in fruit; bracts 1.5–7 mm long; pedicels 0.4–2.2 mm long; bracteoles 0–2; calyx 4.5–8.8 mm long, the tube 2.4–4.1 mm long, campanulate, strigose, the teeth 1.4–5 mm long; flowers 7–11.5 mm long, greenish to ochroleucous, often suffused or veined purplish, or pink-purple; pods ascending to spreading, obliquely ovoid or oblong-ellipsoid, 6–14 mm long, 3.5–5.7 mm wide, variably compressed, strigose, unilocular. Mountain brush, cool desert shrub, pinyon-juniper, and ponderosa pine communities at 1600 to 2430 m in Beaver, Garfield, Iron, Kane, and Washington cos.; Nevada, Arizona, and New Mexico. Our material be-

longs to var. *humivagans* (Rydb.) Barneby; 34 (xi).

Astragalus iodanthus S. Wats. Humboldt River Milkvetch. [*Tragacantha iodantha* (S. Wats.) Kuntze; *Xylophacos iodantha* (S. Wats.) Rydb.; *A. iodanthus* var. *diaphanoides* Barneby.]. Perennial, caulescent, 8–35 cm long, from a branching caudex; pubescence basifixed; stems prostrate to decumbent; stipules 2–6 mm long, all distinct; leaves 2–8 cm long; leaflets 7–21, 3–18 mm long, 2–12 mm wide, obovate to oblong or oblanceolate to elliptic, truncate to retuse, obtuse or mucronate, sparingly strigose to glabrous on both sides; peduncles 1–4.5 cm long, shorter than the leaf; racemes 7- to 17-flowered, the flowers ascending to spreading at anthesis, the axis 0.5–4.5 cm long in fruit; bracts 1–3 mm long; pedicels 0.3–2 mm long; bracteoles 2; calyx 5–8 mm long, the tube 3.4–5 mm long, short-cylindric, strigose, the teeth 1.3–3 mm long; flowers 12–15.5 mm long, pink-purple to pale; pods ascending to declined, sessile, the body curved through a half-circle, 20–40 mm long, 5–8 mm thick, dorsiventrally or trigonously compressed, obliquely lanceolate, unilocular or semibilocular, strigose; ovules 14–30. Juniper-sagebrush community at about 1670 m in Box Elder Co.; Oregon, California, and Nevada; 1 (0).

Astragalus iselyi Welsh. Isely Milkvetch. Perennial, caulescent, 8–25 cm tall, from a branching caudex; pubescence basifixed; stems ascending to erect; stipules 3–9 mm long, all distinct; leaves 3.2–8.5 cm long; leaflets (3) 5–13, 7–23 (37) mm long, 3–9 (16) mm wide, elliptic to rhombic, acute to mucronate, sparsely strigose to glabrate on both sides; peduncles 1.7–10 cm long; racemes 7- to 20-flowered, the flowers spreading at anthesis, the axis 1–3 cm long in fruit; bracts 2–4.5 mm long; pedicels 0.8–2.5 mm long; bracteoles 0; calyx 6.7–10 mm long, the tube 5.5–6.3 mm long, cylindric, strigulose, the teeth 1.8–3.1 mm long, subulate; flowers 17–18 mm long, ochroleucous, concolorous; pods spreading-declined, sessile or subsessile, inflated, subcylindric, 25–38 mm long, 10–15 mm thick, strigose, leathery, unilocular; ovules 38–44. Morrison and Paradox formations in pinyon-

juniper and salt desert shrub communities at 1530 to 1830 m on western foothills of the LaSal Mountains in Grand and San Juan cos.; endemic. The Isely milkvetch is closely allied to *A. sabulosus* (q.v.). Both are obligate selenophytes of gypsiferous clays and silts of the Grand River Valley; 7 (iii).

Astragalus jejunus S. Wats. Starveling Milkvetch. [*Tragacantha jejuna* (S. Wats.) Kuntze; *Phaca jejuna* (S. Wats.) Rydb.]. Perennial, acaulescent, 1–4 cm tall, from a much-branched caudex; pubescence basifixed; stems obsolete, obscured by stipules and leaf bases; stipules 1.5–3 mm long, all connate-sheathing; leaves 1–4 cm long; leaflets 9–15, 1–5 mm long, 0.5–1 mm wide, linear to narrowly elliptic, obtuse to acute, involute, strigose on both sides; peduncles 0.5–3.5 cm long; racemes 3- to 7-flowered, the flowers spreading at anthesis, the axis 0.2–1 cm long in fruit; bracts 1–1.5 mm long; pedicels 1–2.5 mm long, very slender; bracteoles 0; calyx 2.3–3 mm long, the tube 1.5–2 mm long, campanulate, strigose, the teeth 0.5–1 mm long subulate; flowers 5–6.5 mm long, pink-purple; pods spreading, sessile, bladdery-inflated, subglobose, 10–17 mm long, 7–11 mm thick, mottled, strigose, unilocular; ovules 10–14. Sagebrush and sagebrush-juniper communities, often on windswept ridgetops at 1830 to 2300 m in Rich Co.; southwestern Wyoming and east-central Nevada. This tiny plant has as its nearest congener *A. limnocharis* (q.v.), a plant of higher elevations in central southern Utah; 2 (0).

Astragalus kentrophyta A. Gray. Kentrophyta. Perennial, caulescent, mat-forming to erect, 5–45 cm long, from a caudex and stolon-like creeping stems; pubescence basifixed or malpighian; stems prostrate to erect, compact to elongate; stipules 1.5–5 mm long, at least some connate-sheathing; leaves 0.4–2.6 cm long; leaflets 3–9, 3–13 mm long, 0.5–1.5 mm wide, linear to narrowly elliptic or lanceolate, all continuous with the rachis and spinulose-tipped, strigose on both sides; peduncles to 1.5 cm long; racemes 1- to 3-flowered, the flowers declined at anthesis, the axis to 0.5 cm long in fruit; bracts 0.8–3.5 mm long; pedicels 0.5–2 mm long; bracteoles 0; calyx 2.4–8.3

mm long, the tube 1.3–3.3 mm long, campanulate, strigose, the teeth 1.5–5 mm long, subulate; flowers 4.5–10 mm long, pink-purple or whitish, ochroleucous, or purplish-tinged; pods declined or spreading, sessile, elliptic to oblong or lance-acumuminate in outline, usually curved, 4–10 mm long, 1.3–4 mm wide, strigose, unilocular; ovules 2–8. Three rather distinctive varieties occur in Utah.

- 1. Pubescence entirely of basifixed hairs; plants prostrate, of barrens at high elevations *A. kentrophyta* var. *implexus*
- Pubescence mostly of malpighian hairs; plants prostrate to erect, of low to high elevations 2
- 2(1). Calyx 6–8.3 mm long, the teeth 3.4–5 mm long; pods 7–10 mm long; plants prostrate, of sandy sites in canyons of the Colorado *A. kentrophyta* var. *coloradoensis*
- Calyx 3.4–5.5 mm long, the teeth 1.5–2.4 mm long; pods 4–7 mm long; plants erect or prostrate, usually of clay or silty soils at low to higher elevations 3
- 3(2). Plants prostrate; pods 3–4.5 mm long, beakless or nearly so; known from Daggett Co. *A. kentrophyta* var. *jessiae*
- Plants erect or prostrate; pods 4–7 mm long, beaked; known from Duchesne Co., southward *A. kentrophyta* var. *elatus*

Var. *coloradoensis* M. E. Jones. Canyon Kentrophyta. [*A. montanus* var. *coloradoensis* (M. E. Jones) M. E. Jones; *Kentrophyta coloradoensis* (M. E. Jones) Rydb.]. Wash bottoms and rimrock in mixed desert shrub communities at 970 to 1630 m in Emery, Garfield, Kane, and Wayne cos.; Coconino Co., Arizona; a Colorado Plateau endemic; 15 (v).

Var. *elatus* Wats. Tall Kentrophyta. [*A. viridis* var. *impensus* Sheldon; *A. kentrophyta* var. *impensus* (Sheldon) M. E. Jones; *A. impensus* (Sheldon) Woot. & Standl.; *A. montanus* var. *impensus* (Sheldon) M. E. Jones; *A. tegetarius* var. *elatus* (S. Wats.) Barneby]. Juniper-pinyon, ponderosa pine, pine-spruce, mixed (often salt) desert shrub, and floodplain communities at 1530 to 2600 m in Beaver, Duchesne, Emery, Garfield, Iron, Kane, Piute, Sevier, and Wayne cos.; California, Nevada, Arizona, Colorado, and New Mexico. Both erect and prostrate phases are known, the presence of malpighian hairs is diagnostic; 45 (xvii).

Var. *implexus* (Canby) Barneby. Mountain Kentrophyta. [*A. tegetarius* var. *implexus* Canby; *A. tegetarius* S. Wats.; *Tragacantha tegetaria* (S. Wats.) Kuntze; *Homalobus tegetarius* (S. Wats.) Rydb.; *A.*

montanus var. *tegetarius* (S. Wats.) M. E. Jones; *A. tegetarius* var. *rotundus* M. E. Jones, type from Loa; *A. kentrophyta* var. *rotundus* (M. E. Jones) M. E. Jones]. Ridge-tops and breaks, commonly in barrens, at 2130 to 3500 m in Box Elder, Cache, Garfield, Iron, Juab, Kane, Salt Lake, Sanpete, Sevier, Summit, Tooele, and Utah cos.; Oregon to Montana and south to California, Nevada, and New Mexico; 48 (vii).

Var. *jessiae* (Peck) Barneby. Jessie Kentrophyta. [*A. jessiae* Peck]. White volcanic ash “barrens” at 1770 m in Daggett Co.; eastern Oregon, Idaho, and Wyoming; 1 (0).

***Astragalus lancearius* A. Gray.** Lancer Milkvetch. [*Homalobus lancearius* (A. Gray) Rydb.]. Perennial, caulescent, rush-like, 15–55 cm tall, arising from a subterranean caudex; pubescence basifixed; stems erect or ascending; stipules 2–7 mm long, all distinct; leaves 1.5–10.5 cm long, some or most of them reduced to the rachis some with leaflets 3–7 in number, 2–14 mm long, 0.5–1.5 mm wide, linear to oblong, acute to obtuse, strigose on both sides; peduncles 4–23 cm long; racemes very loosely 6- to 25-flowered, the flowers ascending at anthesis, the axis 3–19 (26) cm long in fruit; bracts 1–1.5 mm long; pedicels 1–3 mm

- Pods not or scarcely inflated; herbage greenish, the stems not or seldom
canescent; plants of various distribution, but not as above 8
- 8(7). Flowers relatively large, the keel 10–15 mm long; plants from the Virgin
and Colorado River canyons *A. lentiginosus* var. *palans*
- Flowers smaller, the keel 8.5–10 mm long; plants rare and obscure, known
only from “Bear Valley,” Iron Co. *A. lentiginosus* var. *ursinus*
- 9(5). Pods thinly papery, diaphanous; plants of eastern Kane Co.
..... *A. lentiginosus* var. *wahweapensis*
- Pods stiffly papery to leathery, opaque or nearly so; plants of various distri-
bution 10
- 10(9). Leaflets 9–17; peduncles 1–5 cm long, shorter than the subtending leaves;
flowers pale pink to whitish, or less commonly pink-purple; plants uncom-
mon in northern Utah *A. lentiginosus* var. *platyphyllidius*
- Leaflets 15–23; peduncles 2.5–8 cm long, mostly longer than the subtending
leaves; plants variously distributed 11
- 11(10). Pods commonly strongly curved, with a long, lance-acuminate beak; plants
common in Utah *A. lentiginosus* var. *araneosus*
- Pods commonly little curved, with a broad triangular beak; plants uncom-
mon in eastern Garfield and San Juan cos. *A. lentiginosus* var. *albiflorus*

Var. *albiflorus* (A. Gray) Schoener. Bladder Milkvetch. [*A. diphysus* var. *albiflorus* A. Gray; *A. diphysus* A. Gray; *A. lentiginosus* var. *diphysus* (A. Gray) Jones; *Tragacantha diphysa* (A. Gray) Kuntze; *Cystium diphysum* (A. Gray) Rydb.] Pinyon-juniper and mixed desert shrub communities at 1470 to 1970 m in the Henry Mountains, Garfield Co., and in San Juan Co.; Colorado, Arizona, and New Mexico. The Utah materials are transitional to var. *araneosus* on the one hand and to var. *palans* on the other. The name is a misnomer, since the flowers are ordinarily a bright pink-purple; 3 (ii).

Var. *araneosus* (Sheldon) Barneby. Cobweb Milkvetch. [*A. araneosus* Sheldon, type from Frisco; *A. palans* var. *araneosus* (Sheldon) M. E. Jones; *Cystium araneosum* (Sheldon) Rydb.; *A. lentiginosus* var. *chartaceus* M. E. Jones, type from Ephraim]. Sagebrush, mixed desert shrub, pinyon-juniper, and less commonly, in mountain brush communities at 1270 to 2430 m in Box Elder, Beaver, Garfield, Iron, Juab, Kane, Millard, Piute, Sanpete, Sevier, Tooele, and Wayne cos.; Nevada. The var. *araneosus* is the common short-racemed milkvetch with

bright pink-purple flowers in much of south-central to western Utah. It approaches var. *albiflorus* in some of its technical features. Acquisition of specimens connecting the ranges of vars. *araneosus* and *chartaceus* demonstrate complete intergradation of supposed diagnostic features and dictate that the two should be combined. Because the leaflet number appeared to be fewer than that acceptable for var. *araneosus*, the var. *chartaceus* was construed as to include var. *platyphyllidius* by Schoener (1975). That remainder of the materials treated previously as var. *platyphyllidius* is maintained as such, even though it is hardly uniform; 123 (xxxii).

Var. *fremontii* (A. Gray) S. Wats. Fremont Milkvetch. [*A. fremontii* A. Gray ex torr.; *A. coulteri* var. *fremontii* (A. Gray) M. E. Jones; *Cystium fremontii* (A. Gray) Rydb.] Braided stream gravels and slopes in creosote bush, Joshua tree, and pinyon-juniper communities at 670 to 1230 m in western Washington Co.; California and Nevada; 11 (ii).

Var. *palans* (M. E. Jones) M. E. Jones. Straggling Milkvetch. [*A. palans* M. E. Jones, type from Montezuma Canyon; *Tium*

palans (M. E. Jones) Rydb.]. Salt desert shrub, blackbrush, juniper, pinyon-juniper, and mixed desert shrub communities at 1130 to 1900 m in Carbon, Emery, Grand, Kane, San Juan, Washington, and Wayne cos.; Colorado and Arizona. The straggling milkvetch is the common phase of *A. lentiginosus* in the canyons of the Colorado. It is distinctive in having oblong, usually curved pods, seldom more than 7 mm thick, and usually pale pink-purple flowers; 88 (xxv).

Var. *platyphyllidius* (Rydb.) Barneby. Broad-leaved Milkvetch. [*Cystium platyphyllidium* Rydb.] Sagebrush, pinyon-juniper, and mountain brush communities at 1700 to 2135 m in Daggett, Juab, Summit, and Tooele cos.; Oregon and California east to Wyoming and Colorado. The peduncles and commonly the fruiting racemes are surpassed by the subtending leaves. This feature, coupled with the leaflets which average fewer per leaf seem to distinguish var. *platyphyllidius* from most of var. *araneosus*. Flower color varies from whitish with keel-tip purple to pink-purple throughout; 9 (ii).

Var. *salinus* (Howell) Barneby. Salt Milkvetch. [*A. salinus* Howell; *Cystium salinum* (Howell) Rydb.]. Pinyon-juniper, mountain brush, and sagebrush communities at 1770 to 2430 m in Beaver, Iron and Summit cos.; California, Oregon, Nevada, Idaho, and Wyoming. There appear to be two main centers of distribution of this variety in Utah, one in Iron and Beaver cos., and one in the area of contact of the Uinta and Wasatch mountains in Summit Co. Schoener (1975) reported that salt milkvetch from Salt Lake, Wasatch and Morgan cos., presumably on the basis of plants collected by her, but there are no specimens in the herbarium at BRY from those localities. The tiny flowers and thin diaphanous pods are diagnostic; 12 (vii).

Var. *scorpionis* M. E. Jones. Scorpion Milkvetch. [*Cystium scorpionis* (Jones) Rydb.] Sagebrush community upwards to timberline at 2130 to 3350 m in western Juab Co.; Nevada. This rare, small-flowered plant differs from var. *salinus* mainly in its opaque, leathery pods; 1 (0).

Var. *stramineus* (Rydb.) Barneby. Straw

Milkvetch. [*Cystium stramineum* Rydb., type from southern Utah]. Mixed warm desert shrub community at 900 to 1000 m on the western slope of the Beaverdam Mountains, Washington Co.; Arizona and Nevada. This is the only member of the species having moderate sized flowers known to occur in southwestern Washington Co.; it is a Beaverdam-Virgin endemic; 5 (0).

Var. *ursinus* (A. Gray) Barneby. Bear Milkvetch. [*A. ursinus* A. Gray, type from Bear Valley, south-central Utah]. Habitat and elevation and specific locality are unknown. Presumably, the material was collected in Bear Valley, northeastern Iron Co.; endemic. The variety has been compared with var. *palans* but the small flowers and presumed locality each preclude association with the straggling milkvetch. Possibly, the Bear milkvetch is extinct, but that seems unlikely when one considers the abundant material in the type collection. A catastrophe might account for its disappearance, however; 1 (0).

Var. *vitreus* Barneby. Glass Milkvetch. Creosote bush and mixed warm desert shrub community at 830 to 1430 m in central and eastern Washington Co.; Mohave and Coconino cos., Arizona. In its typical phase the flowers are very pale, either ochroleucous or white tinged with a faint pink to blue-purple. Southward and eastward the flower color becomes a bright pink-purple. The large, glassy, diaphanous pods are distinctive; 20 (iii).

Var. *wahweapensis* Welsh var. nov. *As-tragalo lentiginoso* var. *araneoso* aemulans, differt leguminiibus diaphanis et stramineis. Holotype: Utah, Kane Co., pinyon-juniper community at ca 1900 m in lower Kaiparowits Formation on Four Mile Bench, Welsh 12426, 8 May 1974 (BRY, nine isotypes). Additional materials; Utah, Kane Co., ca. 5 mi south of Cannonville, Welsh 5364, 6 May 1966; do, 4 mi south of Cannonville, Reveal et al 783, 4 June 1967; do, Wahweap Creek, Atwood 3474, 22 Mar. 1972; do, Four Mile Bench, Welsh 12413, 12 Apr. 1974; do, Smoky Mt., Cronquist 10022, 5 May 1965; do, Escalante road, Woodruff 1139, 12 June 1971; do, Four Mile Bench,

Welsh & Murdock 12394, 12395, 17 May 1974; do, Four Mile Bench, Atwood 4064, 1 June 1972; do, Nipple Bench, Atwood & Allen 2920, 14 June 1971; do, Brigham Plains, Atwood & Allen 2791a, 13 June 1970; do, Four Mile Bench, Welsh 12446, 16 June 1974; do, Four Mile Bench, Welsh & Moore 13631, 29 June 1976 (all at BRY). The Wahweap milkvetch is an inhabitant of sandy soils mainly in pinyon-juniper and sagebrush communities at 1670 to 1900 m in the Paria, Wahweap, and Last Chance drainages west of the Kaiparowits Plateau proper. It is compared in the diagnosis to var. *araneosus* which surrounds the region, mainly at lower elevations, but shares features with var. *vitreus*, a low elevation plant to the south and west of the Wahweap centrum, which has more strongly graduated petals and usually larger and paler flowers; 16 (vii).

Astragalus limnocharis Barneby. Navajo Lake Milkvetch. Perennial, subcaulescent, 1–5 cm tall, arising from a branching caudex; pubescence basifixed; stems prostrate to erect; stipules 2–4 mm long, all connate-sheathing; leaves 1.5–7 cm long; leaflets (5) 7–13, 2–9 mm long, 1–2 mm wide, lanceolate to elliptic or oblong, obtuse, strigose beneath, long-ciliate on the involute margin, glabrous above; peduncles 2–5 cm long, reclining in fruit; racemes 2- to 10-flowered, the flowers spreading to declined at anthesis, the axis 0.2–0.5 cm long in fruit; bracts 1–3 mm long; pedicels 0.8–1.5 mm long; bracteoles 0; calyx 2.8–3.6 mm long, the tube 2–2.5 mm long, campanulate, strigose, the teeth 0.7–1.6 mm long, subulate; flowers 6.2–7.5 mm long, ochroleucous, concolorous; pods spreading, sessile, ovoid, bladderly-inflated, 9–18 mm long, 7–13 mm thick, mottled, strigose, unilocular; ovules 10–12. Lake shores and limestone breaks of Wasatch Formation at 2670 to 3400 m in Iron and Kane; endemic. This “lake beauty” has a principal locality on the beach at Navajo Lake where it is evidently dispersed by wave action. Plants can be found along the terraces below the high water line as the lake recedes. Evidently, the nearest allies of the Navajo Lake milkvetch is *A. jejunus* (q.v.), known in Utah only from Rich

Co. and *A. montii* of the Wasatch Plateau; 10 (iii).

Astragalus loanus Barneby. Loa Milkvetch. [*A. newberryi* var. *wardianus* Barneby, type from east of Glenwood]. Perennial, acaulescent, 3–19 cm tall, the caudex branches clothed with a thatch of persistent leaf bases; pubescence malpighian; stipules 5–10 mm long, all distinct; leaves 2–18 cm long; leaflets (1) 3–11, 6–21 mm long, 2–12 mm wide, obovate to elliptic or lanceolate, obtuse to acute, densely strigose on both sides; peduncles 0.5–10 cm long; racemes 2- to 7-flowered, the flowers erect-ascending at anthesis, the axis 0.2–0.8 cm long in fruit; bracts 2.5–6 mm long; pedicels 1.2–1.8 mm long; bracteoles 0–2; calyx 10.7–18.5 mm long, the tube 8.5–14 mm long, cylindric, loosely strigulose, the teeth 1.7–4.5 mm long; flowers 20–28 mm long, ochroleucous or greenish-white often tinged faintly purplish, the keel-tip purple; pods ascending; sessile, inflated, ovoid, 17–30 (40?) mm long, 8–19 mm wide (when pressed), the valves red-purple to straw-colored, hirsute with lustrous long hairs, unilocular; ovules 28–38. Sagebrush and pinyon-juniper communities exclusively on igneous gravels at 1830 to 2570 m in Garfield, Piute, Sevier, and Wayne cos.; endemic. This remarkable species, known until recently from only four collections, apparently consists of two phases, separable inter alia by leaflet shape. The features are apparently not constant, and more specimens are required before the taxonomic status, if any, of the variants will be clarified; 14 (ix).

Astragalus lonchocarpus Torr. Great Rushy Milkvetch. [*Phaca macrocarpa* A. Gray; *Tragacantha lonchocarpa* (Torr.) Kuntze; *Homalobus macrocarpus* (A. Gray) Rydb.; *Lonchophaca macrocarpa* (A. Gray) Rydb.; *A. macer* A. Nels.; *L. macra* (A. Nels.) Rydb.]. Perennial, caulescent, 30–84 cm tall, from a shallowly subterranean caudex; pubescence basifixed; stems erect, often in dense clumps; stipules 1–9 mm long, all distinct; leaves 2–13 cm long, the uppermost and sometimes all simple, the lower with leaflets 3–9, 2–36 mm long, 0.5–4 mm wide, linear to narrowly ob-

lanceolate, obtuse to acute, strigose on both sides or glabrous above; peduncles 6–24 cm long; racemes loosely 7- to 40-flowered, the flowers spreading-declined at anthesis, the axis 3.5–45 cm long in fruit; bracts 0.8–2.5 mm long; pedicels 1.3–4.5 mm long; bracteoles; calyx 5.8–10.3 mm long, usually brown, the tube 5–8 mm long, cylindric, gibbous, strigose, the teeth 0.6–2 mm long, subulate; flowers 13–20 mm long, ochroleucous to almost white, concolorous; pods pendulous, stipitate, the stipe 3–15 mm long, the body elliptic to oblong in outline, 22–50 mm long, 3.3–6.2 mm wide, dorsiventrally compressed, the valves often brownish, strigose, unilocular; ovules 12–26. Salt desert shrub, pinyon-juniper, floodplain, and seep communities at 1170 to 2530 m in Beaver, Carbon, Emery, Garfield, Grand, Iron, Juab, Kane, Millard, Piute, San Juan, Sevier, Tooele, and Wayne cos.; Colorado, New Mexico, Arizona, and Nevada; 85 (xxvii).

Astragalus lutosus M. E. Jones. Dragon Milkvetch. Perennial, short-caulescent, 2–10 cm tall, from a subterranean caudex; pubescence basifixed; stems prostrate to ascending, radiating; stipules 2–5 mm long, all distinct or some shortly connate-sheathing; leaves 1–5.5 cm long; leaflets 15–27, 1–9 mm long, 1–5 mm wide, obovate to elliptic, obtuse to retuse, gray-strigulose on both sides or glabrous above; peduncles 0.5–2 cm long; racemes 6- to 10-flowered, the flowers ascending-spreading at anthesis, the axis 0.3–1 cm long in fruit; bracts 1.5–2.5 mm long; pedicels 1.2–3 mm long; bracteoles 0; calyx 4.8–10.4 mm long, the tube 3.6–7.4 mm long, short-cylindric, strigulose, the teeth 1.2–3 mm long, subulate; flowers 9–17 mm long, white to ochroleucous, the keel-tip purplish; pods spreading to ascending, stipitate, the stipe (gynophore) 1–4.5 mm long, the body ovoid or ellipsoid bladdery-inflated, 15–37 mm long, 8–17 mm thick, strigose, unilocular. Bare places on white (Green River) shale ridges and talus slopes in mixed desert shrub community in southeastern Uintah Co. and in adjacent Rio Blanco Co., Colorado; a Uinta Basin Endemic. The Dragon milkvetch is one of the rarest of our species of milkvetches; 2 (0).

Astragalus malacoides Barneby. Kaiparowits Milkvetch. Perennial, caulescent, 7–25 cm tall, from a slightly subterranean caudex; pubescence basifixed; stems decumbent or prostrate to ascending; stipules 2–7 mm long, all distinct; leaves 4.5–14 cm long; leaflets 15–29, 3–25 mm long, 2–12 mm wide, obovate to oblong or elliptic, obtuse to emarginate, hirtellous beneath, glabrous above; peduncles 4–12 cm long; racemes 10- to 24-flowered, the flowers ascending-spreading at anthesis, the axis 1.2–10 cm long in fruit; bracts 3–5 mm long; pedicels 1–2.5 mm long; bracteoles 0–2; calyx 10–15 mm long, the tube 7–11 mm long, cylindric, hirsutulous, the teeth 2–6.2 mm long, linear-subulate; flowers 16–22 mm long, pink-purple; pods declined to ascending, short-stipitate, the stipe 2–3 mm long, the body oblong, curved, 25–40 mm long, 5–8 mm wide, laterally compressed, hirsutulous, bilocular; ovules 24–30. Straight Cliffs, Wahweap, Kaiparowits, and Moenkopi formations, usually in clay or silty soils, in juniper-pinyon and mixed desert shrub communities at 1600 to 2330 m in Garfield (Circle Cliffs and Tarantula Mesa) and Kane (Kaiparowits vicinity) cos.; endemic; 21 (iv.)

Astragalus marianus (Rydb.) Barneby. Sevier Milkvetch. [*Xylophacos marianus* Rydb., type from Marysvale]. Perennial, acaulescent or subacaulescent, 3–10 cm tall, from a branching caudex; pubescence basifixed; stems 0–6 cm long, the internodes mostly concealed by the stipules; stipules 2–7 mm long, all distinct; leaves 1.2–8.5 cm long; leaflets 7–17, 3–11 mm long, 1–4 mm broad, obovate to oblanceolate, obtuse to emarginate or acuminate to acute, strigose on both sides; peduncles 1–8 cm long; racemes 2- to 10-flowered, the flowers ascending at anthesis, the axis 0.2–3.5 cm long in fruit; bracts 2–4.5 mm long; pedicels 0.8–3 mm long; bracteoles 0–2; calyx 10–13.2 mm long, the tube 7.3–9.4 mm long, cylindric, pilosulous, the teeth 2–3.5 mm long, subulate; flowers 17–24 mm long, pink-purple, often pale; pods spreading-ascending, sessile or nearly so, 10–23 mm long, 7–12 mm thick, ovoid-acuminate, densely shaggy-hirsute, unilocular; ovules 27–36. Oak-sagebrush, mixed warm and cool

desert shrub, pinyon-juniper, and aspen-white fir communities at 900 to 2430 m in Beaver, Garfield, Iron, Juab, Millard, Piute, Sevier, Washington and Wayne cos.; Nevada. The Sevier milkvetch resembles *A. argophyllus* var. *martinii* but the shaggy-hirsute pods and flowers that average smaller are diagnostic; 36 (xviii).

Astragalus megacarpus (Nutt.) A. Gray. Great Bladdery Milkvetch. [*Tragacantha megacarpa* (Nutt.) Kuntze; *A. megacarpus* var. *prodigus* Sheldon.]. Perennial, short-caulescent or subcaulescent, 3–15 (17) cm tall, arising from a caudex; pubescence basifixed; stems 1–5 cm long, in dense, leafy clumps, the internodes mostly obscured by stipules; stipules 2–7 mm long, all distinct; leaves 2–15 (17) cm long; leaflets 7–19, 3–19 mm long, 2–12 mm wide, obovate, ovate, elliptic, or suborbicular, obtuse to retuse and mucronate, strigose to glabrous beneath, glabrous above; peduncles 0.5–6 cm long, much shorter than the leaves; racemes 1- to 7-flowered, the flowers ascending in anthesis, the axis 0.2–2.5 cm long in fruit; bracts 2–5 mm long; pedicels 3.5–8 mm long; bracteoles 0–2; calyx 7–10.2 mm long, the tube 5.2–8.5 mm long, cylindric, strigose, the teeth 1.8–3.5 mm long; flowers 15–23 mm long, pink-purple; pods ascending to descending, stipitate, the stipe (gynophore) 2–4 mm long, the body bladdery-inflated, ellipsoid, 35–65 (70) mm long, 15–31 mm wide (when pressed), commonly mottled, strigose, unilocular; ovules 38–54. Commonly on clay soils, these often saline or calciferous, in salt desert shrub, sagebrush, oakbrush, pinyon-juniper, and ponderosa pine communities at 1650 to 2430 m in Carbon, Duchesne, Emery, Garfield, Iron, Juab, Kane, Millard, Sanpete, and Sevier cos.; Nevada, Wyoming, and

Colorado. The great bladdery milkvetch is among our most distinctive species of *Astragalus*. A plant with its large pods declined on the ground around the base is a surprising sight. Our plants belong to var. *parryi* A. Gray ex S. Wats., sens. str., but this variety apparently differs mainly in flower color (though our plants seem to have smaller calyces too) from var. *megacarpus*, sens. str.; 44 (xii).

Astragalus miser Douglas ex Hook. Weedy Milkvetch. Perennial, caulescent or short-caulescent, 3–35 cm tall, from a branching caudex; pubescence basifixed; stems decumbent to erect, 1–25 cm long or more; stipules 1.5–7 mm long, at least some connate-sheathing; leaves 1.5–2.0 cm long or more; leaflets 3–21, 3–35 mm long, 0.5–7 mm wide, linear to oblong, elliptic, or oval, acute to obtuse or emarginate, strigose beneath, glabrous or glabrate above; peduncles 2–14 cm long; racemes 3- to 20-flowered, the flowers spreading-declined at anthesis, the axis 1–10 cm long in fruit; calyx 2.1–5.2 mm long, the tube 1.9–2.9 mm long, campanulate, strigose, the teeth 0.5–2.5 mm long, subulate; flowers 5.9–10 mm long, pink-purple, ochroleucous, or whitish, often suffused or veined with purple; keel with an upturned usually purple beak; pods declined-pendulous, sessile or nearly so, narrowly oblong or oblanceolate in outline, 12–25 mm long, 2–4 mm wide, strigose, unilocular; ovules 8–19.

The weedy milkvetch is a widespread poisonous plant of middle and upper elevations in much of Utah. Both cattle and sheep are poisoned by this plant. Two rather tenuous varieties are known from Utah, one common and the other evidently rare.

- 1 Leaflets 3–11; flowers 6–8 mm long; pods narrowly oblong in outline; plants rare, scattered in northern Utah *A. miser* var. *tenuifolius*
- Leaflets mostly 11–21; flowers 8–11 mm long; pods oblanceolate in outline; plants common in Utah *A. miser* var. *oblongifolius*

Var. *oblongifolius* (Rydb.) Cronq. Rydberg Weedy Milkvetch. [*Homalobos oblongifolius* Rydb.; *A. hylophilus* var. *ob-*

longifolius (Rydb.) Macbr.; *A. decumbens* var. *oblongifolius* (Rydb.) Cronq.; *Homalobus humilis* Rydb., type from the Tushar

Mts.; *A. carltonii* Macbr., not *A. humilis* MB.] Aspen and mixed-aspen conifer, and coniferous woodlands, and in sagebrush, mountain brush, and alpine meadow communities at 1830 to 3500 m in all Utah counties except Box Elder, Davis, Millard, Morgan, San Juan, Tooele, Washington, and Weber cos., (and to be expected in some of them); Nevada, Arizona, Wyoming, and Colorado; 141 (xxvi).

Var. *tenuifolius* (Nutt.) Barneby. Garrett's Weedy Milkvetch. [*Homalobus tenuifolius* Nutt.; *H. paucijugus* Rydb.; *A. garrettii* Macbr., not *A. paucijugus* Schrenk.]. Sagebrush upwards to mountain summits at 1970 to 3050 m in Rich and Salt Lake (and likely in Summit) cos.; Idaho, Nevada, and Wyoming; 2 (0).

***Astragalus missouriensis* Nutt.** Missouri Milkvetch. Perennial, subcaulescent, 3–12 cm tall, from a caudex; pubescence malpighian; stems prostrate, to 8 cm long, the internodes often concealed by stipules; stipules 2–9 mm long, all distinct; leaves 1.5–12 cm long; leaflets 5–15, 3–15 mm long, 1–8 mm wide, elliptic to obovate, acute to mucronate or obtuse, strigose on both sides; peduncles 1.5–8 cm long; racemes 3- to 12-flowered, the flowers ascending at anthesis, the axis 0.4–3 cm long in fruit; bracts 2.5–8 mm long; pedicels 1–3.5 mm long; bracteoles 0–2; calyx 8.5–13 mm long, the tube 7–10 mm long, cylindric, strigose, the teeth 1.5–3 mm long, subulate; flowers 15–22 mm long, pink-purple, rarely white; pods ascending to descending, sessile, ellipsoid, 15–25 mm long, 7–9 mm thick, curved, dorsiventrally compressed, strigose, unilocular; ovules 35–55. Pinyon-juniper and sagebrush communities at 1600 to 2430 m in Grand and San Juan cos.; Colorado. Our materials are assignable to **var. *amphibolus* Barneby**; 2 (0).

***Astragalus moencoppensis* M. E. Jones.** Moenkopi Milkvetch. [*Cnemidophacos moencoppensis* (M. E. Jones) Rydb.]. Perennial, caulescent, 9–60 cm tall, from a branching caudex; pubescence basifixed; stems erect or ascending, commonly shorter than the longest peduncles; stipules 1.5–7 mm long, at least some connate-sheathing; leaves 4–16.5 cm long; leaflets 5–15, 2–23

mm long, 0.3–2 mm wide, filiform to linear or narrowly elliptic, acute to obtuse, the terminal often contiguous with the rachis, strigose below, glabrous on the involute upper surface; peduncles 4–25 cm long; racemes 6- to 34-flowered, the flowers ascending at anthesis, the axis 3–25 cm long in fruit; bracts 1.5–3.5 cm long; pedicels 0.3–2 mm long; bracteoles 0–1; calyx 5–7.5 mm long, the tube 3–4 mm long, campanulate, white-pilose, the teeth 1.8–3.5 mm long, lance-subulate; flowers 8–11 mm long, pink-purple; pods ascending-spreading, sessile, ovoid to ellipsoid, 6–7 mm long, 2.3–3.4 mm thick, strigulose, unilocular. Salt desert shrub, mixed desert shrub and pinyon-juniper communities at 1330 to 2130 m, usually in clay or silty soils, in Emery, Garfield, Grand, Kane, San Juan and Wayne cos.; Arizona. The Moenkopi milkvetch is a primary selenium indicator of distinctive mein and odor; 44 (xi).

***Astragalus mollissimus* Torr.** Woolly Locoweed. [*A. thompsonae* S. Wats.; *Tragacantha thompsonae* (S. Wats.) Kuntze; *A. bigelovii* var. *thompsonae* (S. Wats.) M. E. Jones; *A. syrticolus* Sheldon]. Perennial, acaulescent, 6–45 cm tall, from a caudex; pubescence basifixed; stems mostly obscured by stipules; stipules 4–13 mm long, all distinct; leaves 2–28 cm long; leaflets 15–35, 2–18 mm long, 1–14 mm wide, obovate to suborbicular or elliptic, obtuse to retuse or acute, densely woolly-tomentose on both sides; peduncles 2.5–24 cm long; racemes 7- to 20-flowered, the flowers ascending at anthesis, the axis 1.5–18 cm long in fruit; bracts 2.5–8 mm long; pedicels 0.5–3 mm long; bracteoles 0–2; calyx 11–15.5 mm long, the tube 7.7–23 mm long, cylindric, villous, the teeth 2–4.2 mm long, subulate; flowers 18–25 mm long, pink-purple; pods descending, sessile, ovoid, 11–23 mm long, 6–11 mm thick, curved, densely villous-tomentose, bilocular; ovules 28–38. Salt desert shrub, mixed desert shrub, grassland, and pinyon-juniper communities at 1130 to 2330 m in Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Kane, Millard, San Juan, Tooele, Uintah, and Washington cos.; Nevada, Colorado, Arizona and New Mexico. The woolly locoweed is one

of the earliest of the species of *Astragalus* to flower in Utah. It has been collected in anthesis as early as February in southern counties. The species as a whole is recognized as being poisonous. The plants are seldom abundant, except along roadsides, and this might account for the lack of reports of poisoning from this entity in Utah; 157 (xxxvi).

***Astragalus montii* Welsh.** Heliotrope Milkvetch. Perennial, subcaulescent, 1–5 cm tall, arising from a branching caudex; pubescence basifixed; stems ascending to erect; stipules 2–4 mm long, all connate-sheathing; leaves 1.3–4.8 cm long; leaflets 5–13, 2–8 mm long, 1–2 mm wide, lanceolate to oblong or elliptic, strigose beneath, not ciliate on the involute margin, glabrous above; peduncles 0.8–4.5 cm long, reclining in fruit; racemes 2- to 8-flowered, the flowers ascending to spreading at anthesis, the axis 0.2–0.5 cm long in fruit; bracts 1–3 mm long; pedicels 0.8–1.5 mm long; bracteoles 0; calyx 3.3–4 mm long, the tube 2.2–2.5 mm long, campanulate, strigose, the teeth 0.6–1.5 mm long, triangular-subulate; flowers 7.2–8 mm long, pink-purple, the wing-tips white; pods spreading, sessile, ovoid, bladderly-inflated, 11–18 mm long, 8–12 mm thick, mottled, strigose, unilocular; ovules 10. The heliotrope milkvetch is known only from Flagstaff Limestone at one locality at 3350 m on the Wasatch Plateau in Sanpete Co.; endemic. The species is a near congener of *A. limnocharis* from the Markagunt Plateau, differing inter alia in the pink-purple flowers which are larger and in the merely strigose (not long ciliate) leaf margins; 4 (i).

***Astragalus monumentalis* Barneby.** Monument Milkvetch. Perennial, acaulescent or subcaulescent, 3–18 cm tall, from a branching caudex; pubescence basifixed or shortly malpighian; stems 1–6 cm long, ascending, the internodes commonly concealed by stipules; stipules 2–4 mm long, all distinct; leaves 1.5–8 (11) cm long; leaflets (5) 9–17 (21), 2–9 mm long, 1–4 mm broad, oval to obovate, elliptic, or oblanceolate, strigulose beneath, glabrous or glabrate above; peduncles 1–12 cm long; racemes 3- to 9-flowered, the flowers ascending at an-

thesis, the axis 0.5–7 cm long in fruit; bracts 1.5–5 mm long; pedicels 0.8–2.2 mm long; bracteoles 0; calyx 3.6–4.5 mm long, the tube 3.1–3.5 mm long, campanulate, strigose, purplish, the teeth 0.5–1 mm long; flowers 8–9 mm long, pink-purple; pods ascending, sessile or nearly so, narrowly oblong to lanceolate in outline, 12–21 mm long, 2.3–3 mm wide, straight or curved, triangular in cross-section, the dorsal suture sulcate, strigose, bilocular, often mottled. Rimrock and other slickrock sites in mixed desert shrub and pinyon-juniper communities at 1230 to 1870 m in Garfield and San Juan cos.; endemic. This is a mirrored-image cogener of *A. cottamii* (q.v.), differing in its smaller floral parts and overall flowers size and in the incipient malpighian pubescence; 19 (xii).

***Astragalus musiniensis* M. E. Jones.** Ferron Milkvetch. [*Xylophacos musiniensis* (M. E. Jones) Rydb.; *A. musiniensis* var. *newberryoids* M. E. Jones, lectotype from the San Rafael Swell.] Perennial, acaulescent, 3–13 cm tall, from a caudex, the branches often clothed with a thatch of persistent leaf bases; pubescence basifixed or incipiently malpighian; stipules 3.5–10 mm long, all distinct; leaves 1.5–13 cm long; leaflets (1) 3–5, 5–35 mm long, 2–11 mm wide, elliptic to lanceolate, acute to obtuse, strigose on both surfaces; peduncles 0.5–7 cm long; racemes 1- to 6-flowered, the flowers erect-ascending at anthesis, the axis 0.2–1.4 cm long in fruit; bracts 1.6–4 mm long; pedicels 1.2–4 mm long; bracteoles 0; calyx 12–15.5 mm long, the tube 9.5–12.7 mm long, cylindric, strigose-pilose, the teeth 1.5–4 mm long; flowers 20–28 mm long, pink-purple; pods ascending, sessile, obliquely ovoid, 15–36 mm long, 8–17 mm thick, dorsiventrally compressed, hirsutulous to villous-hirsute, unilocular. Salt desert shrub, mixed desert shrub, and pinyon-juniper communities at 1430 to 2130 m in Carbon, Emery (type from 2 miles south of Ferron), Garfield, Grand, Kane, and Wayne cos.; endemic. The species was named by Marcus E. Jones for a mountain peak on the Wasatch Plateau many miles remote from the type locality; 30 (vii).

***Astragalus nelsonianus* Barneby.** Nelson

Milkvetch. [*A. pectinatus* var. *platyphyllus* M. E. Jones.]. Perennial, caulescent, 10–30 cm tall, from a subterranean caudex; pubescence basifixed; stems decumbent to ascending or erect; stipules 4–13 mm long, at least some connate-sheathing; leaves 2.5–9 cm long; leaflets 3–13, 10–45 mm long, 2–5 mm wide, narrowly oblong, obtuse to apiculate, strigose on both surfaces, the terminal leaflet continuous with the rachis; peduncles 3–12 cm long; racemes 6- to 20-flowered, the flowers ascending at anthesis, the axis 2–12 cm long in fruit; bracts 2.5–7 mm long; pedicels 1.5–4 mm long; bracteoles 1; calyx 10–14.5 mm long, the tube 7–10.2 mm long, cylindric, strigose, the teeth 2–4.5 mm long; flowers 10–14 mm long, white, concolorous; pods deflexed, sessile, oblong-ellipsoid, 13–33 mm long, 6–12 mm wide, finally laterally compressed, glabrous or pubescent, unilocular; ovules 20–28. Saline soils in desert shrub communities at 2070 to 2100 m in Daggett Co.; Wyoming. The Nelson milkvetch differs from *A. pectinatus* Dougl. ex Don in much the same manner that *A. hamiltonii* differs from *A. lonchocarpus*. The leaves and leaflets of both *A. nelsonii* and *A. hamiltonii* are much broader than those of their counterparts; 3 (0).

Astragalus newberryi A. Gray. Newberry Milkvetch. [*Xylophacos newberryi* (A. Gray) Rydb.; *A. newberryi* var. *castoreus* M. E. Jones, type from Beaverdam Mts.]. Perennial, acaulescent, 2–14 cm tall, from a caudex, the branches commonly clothed with a thatch of persistent leaf bases; pubescence basifixed; stipules 3–11 mm long, all distinct; leaves 1.5–14 cm long; leaflets 3–15, 3–20 mm long, 2–14 mm wide, obovate to elliptic, oblanceolate, or orbicular, acute to obtuse or retuse, villous-tomentulous on both surfaces; peduncles 0.5–11 cm long; racemes 2- to 8-flowered, ascending in flower, the axis 0.2–2.7 cm long in fruit; bracts 3.5–10 mm long; pedicels 1.4–5 mm long; bracteoles 0–2; calyx 11.5–20 mm long, the tube 8–17 mm long, cylindric, vilous, the teeth 1.9–6 mm long, subulate; flowers 20–32 mm long, pink-purple; pods ascending to spreading, sessile or subsessile, ovoid, curved, 18–23 mm long, 7–12 mm thick, densely villous-tomentose, unilocular;

ovules 20–40. Salt desert shrub, mixed desert shrub, sagebrush, mountain brush, and pinyon-juniper communities at 830 to 2300 m in Beaver, Box Elder, Garfield, Iron, Juab, Kane, Millard, Sevier, Tooele, and Washington cos.; Oregon, Nevada, California, Arizona, and New Mexico; 65 (xix).

Astragalus nidularius Barneby. Bird's-nest Milkvetch. Perennial, caulescent 15–51 cm tall, from a subterranean caudex; pubescence basifixed; stems ascending to erect, often branched; stipules 1–6 mm long, at least some connate-sheathing; leaves 1.5–7 cm long; leaflets 5–11, 2–20 mm long, 1.3–2 mm wide, linear to oblong, obtuse to emarginate or acute, the terminal leaflet of upper leaves sometimes continuous with the rachis, pubescent on both sides or glabrous above; peduncles 4–16 cm long; racemes (3) 8- to 33-flowered, the flowers ascending to declined at anthesis, the axis 1.5–28 cm long in fruit; bracts 1.2–2.2 mm long; pedicels 1.2–3 mm long; bracteoles 0–2; calyx 3.8–7 mm long, the tube 3.3–5.5 mm long, campanulate, strigose, the teeth 1.5–2.2 mm long, subulate; flowers 10.5–15 mm long, pink-purple; pods pendulous, stipitate, the stipe 3.5–6 mm long, the body narrowly oblong, 20–32 mm long, 3.5–4.5 mm thick, dorsiventrally compressed, strigose, unilocular; ovules 20–24. Pinyon-juniper and mixed desert shrub communities on Cutler, Moenkopi, and Navajo formations at 1370 to 1900 m in Garfield, San Juan, and Wayne cos.; endemic. The bird's-nest milkvetch is a close ally of *A. harrisonii* (q.v.), from which it is separated geographically and in technical morphological features; 13 (xii).

Astragalus nuttallianus Nutt. Small-flowered Milkvetch. Annual or winter annual, caulescent, 2–35 cm long, from a taproot; pubescence basifixed; stems prostrate to decumbent or erect; stipules 1–5 mm long, all distinct; leaves 1–8.5 cm long; leaflets 7–19, 2–14 mm long, 1–6 mm wide obovate to elliptic or oblong, acute to rounded or retuse to emarginate, strigose to glabrous on both sides; peduncles 1–8 cm long; racemes 1- to 7-flowered, the flowers ascending to declined at anthesis, the axis 0.2–2 cm long in fruit; bracts 0.5–2.5 mm long; pedicels 0.4–1.6 mm long; bracteoles 0; calyx 3.2–5.4

mm long, the tube 1.9–2.8 mm long, campanulate, strigose, the teeth 1–2.2 mm long, subulate; flowers 4.1–7.6 mm long, pink-purple to whitish or faintly tinged with purplish; pods ascending to declined, sessile

or subsessile, narrowly oblong, curved, 12–21 mm long, 1.9–3.3 mm wide, glabrous to strigose, bilocular or nearly so; ovules 12–18. There are two allopatric varieties of this annual milkvetch in Utah.

1. Leaflets 9–15; axis of raceme 0.5–2 cm long in fruit; keel tip blunt; plants of eastern Kane Co. and eastward in Utah *A. nuttallianus* var. *micranthiformis*
- Leaflets 7–11; axis of raceme 0.1–1 cm long in fruit; keel tip acute to subacute, usually beaked; plants from central Kane Co. west to Washington Co., and disjunctly north to Tooele Co. *A. nuttallianus* var. *imperfectus*

Var. *imperfectus* (Rydb.) Barneby. [*Ham-osa imperfecta* Rydb.]. Creosote bush, warm desert shrub, and cool desert shrub communities at 670 to 1470 m in Kane and Washington and disjunctly in Tooele (Stansbury Island) cos.; Nevada, California, and Arizona; 23 (iv).

Var. *micranthiformis* Barneby. Blackbrush, mixed desert shrub, and pinyon-juniper communities at 1130 to 1670 m in Emery, Garfield, Grand, Kane, and San Juan cos.; Arizona, Colorado, and New Mexico; 13 (vii).

***Astragalus oophorus* S. Wats.** Egg Milkvetch. Perennial, caulescent, 15–30 cm tall, from a caudex; pubescence basifixed; stems decumbent to ascending, radiating from the caudex; stipules 1.5–7 mm long, all distinct; leaves 3–21 cm long; leaflets 9–25, 3–20

mm long, 2–11 mm wide, oval to obovate or orbicular, obtuse to retuse or mucronate, glabrous on both surfaces, often ciliate; peduncles 4–13 cm long; racemes 4- to 13-flowered, the flowers spreading at anthesis, the axis 1–8 cm long in fruit; bracts 1.5–5 mm long; pedicels 2–6 mm long; bracteoles 0–1; calyx 6–12 mm long, the tube 4–8.5 mm long, cylindric or short-cylindric, glabrous or sparingly strigose, the teeth 2–5 mm long, subulate; flowers 17–24 mm long, ochroleucous, concolorous, or pink-purple and with white wing-tips; pods spreading to pendulous, stipitate the stipe (gynophore) 3.5–12 mm long, the body bladderly-inflated, ellipsoid, 25–55 mm long, 10–30 mm wide (when pressed), glabrous, unilocular, often mottled; ovules 28–54. Two distinctive varieties are present in Utah.

1. Flowers pink-purple; calyx tube 7.8–9 mm long; stipe (gynophore) 10–12 mm long; plants of western Iron and Beaver cos. *A. oophorus* var. *lonchocalyx*
- Flowers ochroleucous; calyx tube 4–7 mm long; stipe (gynophore) 3.5–8.5 mm long; plants widespread *A. oophorus* var. *caulescens*

Var. *caulescens* (M. E. Jones) M. E. Jones. Pallid Egg Milkvetch. [*A. megacarpus* var. *caulescens* M. E. Jones, type from Loa Pass; *A. artipes* A. Gray; *Phaca artipes* (A. Gray) Rydb.; *A. oophorus* var. *artipes* (A. Gray) M. E. Jones]. Sagebrush, pinyon-juniper, and mountain brush communities at 1370 to 2430 m in Beaver, Garfield, Iron, Juab, Kane, Millard, Piute, Sanpete, Sevier, Tooele, Utah, and Washington cos.; Colorado, Arizona, and Nevada. Please compare this variety to *A. beckwithii* var. *beckwithii*; 66 (vi).

Var. *lonchocalyx* Barneby. Pink Egg Milkvetch. Pinyon-juniper, sagebrush, and mixed desert shrub communities at 1770 to 2300 m in western Iron and Beaver cos.; Lincoln Co., Nevada; a Great Basin endemic; 7 (iv).

***Astragalus pardalinus* (Rydb.) Barneby.** Panther Milkvetch. [*Phaca pardalina* Rydb.] Perennial (short-lived) or functionally annual, caulescent, 8–30 (35) cm tall; pubescence basifixed; stems decumbent to ascending, forming rounded clumps; stipules 2–5 mm long, all distinct or some shortly

connate-sheathing; leaves 3–7 cm long; leaflets 11–17, 3–20 mm long, 1–5 mm wide, oblong to oblanceolate or obovate, truncate to retuse, mucronate, or acute, strigulose on both sides; peduncles 1–4 cm long; racemes 3- to 8-flowered, the flowers ascending at anthesis, the axis 1–4 cm long in fruit, bracts 1–3.5 mm long; pedicels 0.8–3.6 mm long; bracteoles 0–2; calyx 4.8–6.6 mm long, the tube 2.3–2.8 mm long, campanulate, villous, the teeth 2.3–2.8 mm long, subulate; flowers 6.3–8.2 mm long, pink-purple (soon fading yellowish); pods declined, sessile or nearly so, obliquely ovoid-ellipsoid, inflated, 13–21 mm long, 8–11 mm thick, straight or only slightly curved, villosulous with spreading-curved hairs, unilocular; ovules 20–28. Mixed desert shrub and pinyon-juniper communities usually in sandy soils at 1270 to 1600 m in Emery (type from Cedar Mt.), Garfield, and Wayne cos.; endemic. The panther milkvetch shares several salient features with the closely related but largely allopatric taxa *A. pubentissimus* and *A. sabulonum* (q.v.). From both of these, *A. pardalinus* differs in its straight or nearly straight pods, which bear 20–28 ovules (not 9–19). The main area of distribution of the panther milkvetch is on the sandy eastern foot of the San Rafael Swell which breaks abruptly to the canyons of the Green and Colorado rivers; 13 (vii).

***Astragalus pattersonii* A. Gray ex Brand.** Patterson Milkvetch. [*Tragacantha pattersonii* (A. Gray) Kuntze; *Phacopsis pattersonii* (A. Gray) Rydb.; *Rydbergiella pattersonii* (A. Gray) Fedde; *Jonesiella pattersonii* (A. Gray) Rydb.]. Perennial, caulescent, 20–45 (50) cm tall, from a branching caudex; stems decumbent to ascending or erect; stipules 3–8 mm long, all usually distinct; leaves 5–13 cm long; leaflets 7–15 or more, 6–38 mm long, 3–16 mm wide, elliptic to lanceolate, oblanceolate, or obovate, obtuse to acute, retuse, or mucronate, strigose to glabrous on both sides; peduncles 3–18 cm long; racemes 6- to 24-flowered, the flowers declined-nodding at anthesis, the axis 2–15 cm long in fruit; bracts 2–8 mm long; pedicels 1–4.5 mm long; bracteoles 2; calyx 8.8–14.2 mm long, the tube 6–8.8 mm long, cylindric, gibbous,

pale tan or whitish, colored like the petals, thinly strigulose, the teeth 2.3–6.5 mm long, subulate; flowers 14–22 mm long, white, concolorous or the keel tip faintly purplish; pods erect, sessile, cylindric to ellipsoid or ovoid, 17–35 mm long, 6–10 mm thick, glabrous or puberulent, unilocular; ovules 22–38. Pinyon-juniper and mixed desert shrub communities at 1470 to 2300 m, disjunct in Utah, in Carbon, Garfield, Sevier, and Uintah cos.; Colorado and Arizona. The Patterson milkvetch is a primary selenium indicator, usually of clay and silty soils. The Arizona materials are known from the valley of Kanab Creek, and this plant might also occur in adjacent Kane Co. The Patterson milkvetch is a handsome and striking plant, which is similar in many ways with *A. praelongus* (q.v.), from which it differs in the whitish, concolorous calyces and petals, and in the erect pods; 11 (vi).

***Astragalus perianus* Barneby.** Rydberg Milkvetch. Perennial, short-caulescent, 1–6 cm tall, from a shallowly subterranean, branching caudex; pubescence basifixed; stems prostrate, 3–12 cm long; stipules 1–2.5 mm long, at least some connate-sheathing; leaves 1–3 cm long; leaflets 7–19, 1–5 mm long, 1–3 mm wide, oval to obovate, retuse, strigulose on both sides or glabrate above; peduncles 0.3–2.2 cm long; racemes 2- to 6-flowered, the flowers spreading at anthesis, the axis 0.2–0.8 cm long in fruit; bracts 0.8–1.2 mm long; pedicels 1.4–21.5 mm long; bracteoles 0; calyx 3.5–4.2 mm long, the tube 2.3–3 mm long, campanulate, pilosulous, purplish, the teeth 1–1.4 mm long, subulate; flowers 6.8–8.5 mm long, whitish, faintly suffused with pink or purple; pods ascending to declined, sessile, bladdery-inflated, ovoid, 10–23 mm long, 8–14 mm wide (when pressed), strigose, purple-mottled, unilocular; ovules 18–20. Tertiary igneous gravels, often on barrens, in alpine sites at 3050 to 3350 m in Garfield (Sevier Plateau) and Piute (Tushar Mts.) cos.; endemic. This beautiful low plant was first collected by P. A. Rydberg on 23 July 1905. It remained unnamed until its publication by Barneby (1964:973), and was not discovered a second time until 26 June 1975, some 70 years after its original

collection. The Rydberg milkvetch most closely resembles *A. serpens* (q.v.), but its relationship purportedly lies elsewhere; 7 (iv).

***Astragalus pinonis* M. E. Jones.** Pinyon Milkvetch. [*Pisophaca pinonis* (M. E. Jones) Rydb.]. Perennial, caulescent, 10–55 cm tall, from a shallowly subterranean caudex; pubescence basifixed; stems erect or reclining, commonly growing through sagebrush canopy; stipules 1.5–5 mm long, all distinct; leaves 2–11 cm long; leaflets 9–19, 2–18 mm long, 1–4 mm wide, linear to oblong, obtuse to retuse, strigose on both surfaces; peduncles 1.5–8 cm long; racemes 5- to 19-flowered, the flowers ascending-spreading at anthesis, the axis 2–7 cm long in fruit; bracts 1–2 mm long; pedicels 1–3 mm long; bracteoles 0–1; calyx 4.3–5.6 mm long, the tube 2.3–3.8 mm long, campanulate, strigose, the teeth 1–2 mm long, subulate; flowers 8.2–10.3 mm long, greenish to ochroleucous, suffused with purple; pods spreading-declined, subsessile, oblong-ellipsoid, straight to slightly curved, 20–35 mm long, 5.5–8.5 mm thick, terete or nearly so, strigose, unilocular; ovules 32–42. Sagebrush and sagebrush mixtures in pinyon-juniper woodlands at 1580 to 2275 m in Beaver and Juab cos.; Nevada; a Great Basin endemic. The pinyon milkvetch is obscure and apparently rare in Utah. The type was collected at Frisco, Beaver Co., where M. E. Jones found the plant in 1880 (on June 22). It grows up through low plants of sagebrush and is difficult to see. The plants resemble those of *A. convallarius*, but the thicker pods and jointed terminal leaflets of *A. pinonis* are diagnostic; 2 (0).

***Astragalus platytropis* A. Gray.** Broad-keeled Milkvetch. [*Tragacantha platytropis* (A. Gray) Kuntze; *Phaca platytropis* (A. Gray) Rydb.; *Cystium platytrope* (A. Gray) Rydb.]. Perennial, acaulescent or nearly so, 2–7 cm tall, from a branching caudex, the branches often with a thatch of persistent leaf bases; pubescence basifixed; stems 0–2 cm long, prostrate-ascending or erect; stipules 1.5–5 mm long, at least some connate-sheathing; leaves 1–7 cm long; leaflets 5–15,

2–11 mm long, 1.5–7 mm wide, elliptic to obovate, oblong, or oval, acute to obtuse or retuse silvery-strigose on both sides; peduncles 1.5–6.5 cm long; racemes 2- to 9-flowered, the flowers ascending at anthesis, the axis 0.2–0.6 cm long in fruit; bracts 0.6–2 mm long; pedicels 0.7–1.9 mm long; bracteoles 0–2; calyx 3–5.4 mm long, the tube 2–3.4 mm long, campanulate, strigose, the teeth 0.2–2.1 mm long, subulate; flowers 7–9.5 mm long, pink-purple; pods ascending, sessile, bladderly-inflated, ovoid to subglobose, 15–33 mm long, 10–22 mm wide (when pressed), purple-mottled, strigulose, semibilocular; ovules 26–34. Ridge tops in shrub communities at 2400 to 3500 m in western Beaver and Tooele cos.; Nevada and California. This milkvetch is known in Utah only from the Mountain Home and Deep Creek ranges, where it occurs on limestone summits in crevices; 2 (i).

***Astragalus praelongus* Sheldon.** Stinking Milkvetch. Perennial, caulescent, 10–90 cm tall, from a branching caudex; pubescence basifixed; stems erect or ascending, forming clumps; stipules 2.5–9 mm long, all distinct; leaves 3–22 cm long; leaflets 7–33, 3–50 mm long, 2–24 mm wide, obovate, elliptic, oblong, lanceolate, or oblanceolate, obtuse or retuse to acute, sparingly strigose beneath, glabrous above; peduncles 4–26 cm long; racemes 10- to 33-flowered, the flowers deflexed at anthesis, the axis 3–16 cm long in fruit; bracts 1–7 mm long; pedicels 1–7 mm long; bracteoles 2; calyx 5.8–14 mm long, the tube 4.4–7.5 mm long, cylindric, gibbous, glabrous, or thinly strigose, green or yellowish, usually differently colored than the petals, the teeth 0.3–6 mm long, subulate; flowers 15–24 mm long, ochroleucous, the keel often faintly purplish-tipped; pods erect to declined, sessile, subsessile, or stipitate, inflated, ellipsoid, ovoid, obovoid, or subglobose, 18–42 mm long, 15–25 mm thick, usually straight, glabrous or puberulent, subunilocular, leathery-woody; ovules 40–75. The stinking milkvetch is represented in Utah by three more or less distinctive varieties.

1. Pods long-stipitate, the stipe 4–8 mm long; plants of San Juan Co. *A. praelongus* var. *lonchopus*
- Pods sessile or short-stipitate, the stipe, when present, less than 3 mm long; plants seldom of San Juan Co. 2
- 2(1). Pods narrowly elliptic to oblong, 6–10 mm thick; plants of Beaver, Iron, Millard, and Sevier cos. eastward to east-central Utah *A. praelongus* var. *ellisiae*
- Pods broadly oblong to elliptic, 10–15 mm thick; plants of Garfield, Kane, Washington, and Wayne cos., and disjunctly in Sevier Co. *A. praelongus* var. *praelongus*

Var. *ellisiae* (Rydb.) Barneby in Turner. [*Jonesiella ellisiae* Rydb.]. Clay soil, commonly on Mancos Shale, Monekopi, and Chinle formations, but also on alluvial substrates containing selenium, at 1330 to 1970 m in Beaver, Carbon, Emery, Grand, Iron, Millard, northern San Juan, Sevier, and Wayne cos.; Colorado, New Mexico, and Texas. The Ellis stinking milkvetch passes by degree into var. *praelongus*. It seems clear, however, that most of the Great Basin populations are more closely allied with those of the San Rafael Swell region than they are with those of Washington Co. The relationship appears to have resulted from migration of plants of the *ellisiae* type through passes in the Wasatch Plateau rather than by a north-south exchange of typical phases; 54 (xviii).

Var. *lonchopus* Barneby. Clay, seleniferous soils of various formations, in blackbrush, mixed desert shrub, and pinyon-juniper communities at 1300 to 1925 m in southern San Juan Co.; Arizona; a Colorado Plateau endemic; 13 (iii).

Var. *praelongus* [A. *procerus* Gray, not Boiss. & Housskn.; A. *pattersonii* var. *praelongus* (Sheldon) M. E. Jones; *Phacopsis praelongus* (Sheldon) Rydb.; *Rydbergeilla praelonga* (Sheldon) Fedde & Sydow; *Jonesiella praelonga* (Sheldon) Rydb.]. Clay and silt of the Mancos Shale, Tropic Shale, Moenkopi, and Chinle formations, and other seleniferous soils, in salt desert shrub and pinyon-juniper communities at 770 to 2530 m in Garfield, Kane, Sevier, Washington, and Wayne cos.; Nevada, Arizona, and New

Mexico. The type variety of stinking milkvetch demonstrates much variation. The most extreme phase occurs in Washington and portions of Kane cos., and has fistulose tall stems and greatly thickened pods. Still another from Washington Co. has pinkish-lavender flowers. Most of these plants are primary selenophytes, however, a small population from near the mouth of Zion Canyon lacked the characteristic odor of selenium and presumably was not seleniferous; 81 (xxv).

***Astragalus preussii* A. Gray.** Preuss Milk-vetch. Perennial, caulescent, mostly 12–45 cm long, from a woody caudex; pubescence basifixed; stems erect or ascending, forming clumps; stipules 2–7 mm long, all distinct; leaves 3.5–13 cm long; leaflets 7–25, 1–28 mm long, 1–6 mm wide, obovate or obcordate to oblong, narrowly elliptic, lanceolate, or linear, emarginate to rounded, obtuse, or acute, glabrous; peduncles 2–15 cm long; racemes 3- to 22-flowered, the flowers ascending, the axis 1–20 cm long in fruit; bracts 1.5–4 mm long; pedicels 1–5.5 mm long; bracteoles 2; calyx 6.4–12.3 mm long, the tube 5.1–9.7 mm long, cylindric, thinly strigose, purple, the teeth 1.3–2.6 mm long, subulate; flowers, 14–24 mm long, pink-purple, or bicolored; pods erect to ascending, stipitate, or sessile, the stipe 2–7 mm long, the body oblong-ellipsoid, inflated, 12–34 mm long, 6–13 mm thick, glabrous or puberulent, stiffly papery to leathery, unilocular; ovules 20–44. Two rather distinctive varieties are present in Utah.

1. Pods sessile or nearly so; racemes 4–20 cm long in fruit; plants of southwestern Washington Co. *A. preussii* var. *laxiflorus*
- Pods stipitate; racemes 1–9 cm long in fruit; plants of eastern Kane Co. and northeastward *A. preussii* var. *preussii*

Var. laxiflorus A. Gray. [*A. preussii* var. *laxispicatus* Sheldon; *Phaca laxiflora* (A. Gray) Rydb.]. Creosote bush community at 2200 to 2500 m in the Beaver Dam Mountains, Washington Co.; Nevada. This variety is not known from Utah in modern collections, but contemporary specimens have been seen from Nevada; 1 (0).

Var. preussii. [*Phaca preussii* (A. Gray) Rydb.; *Tragacantha preussii* (A. Gray) Kuntze; *Rydbergiella preussii* (A. Gray) Tydb.; *A. preussii* var. *latus* M. E. Jones, type from Green River; *A. preussii* var. *sulcatus* M. E. Jones, type from Westwater; *A. preussii* var. *arctus* Sheldon; *Rydbergiella arcta* (Sheldon) Tydb.; *A. arctus* (Sheldon) Tidestr.; *Jonesiella arcta* (Sheldon) Rydb.]. Blackbrush, mixed desert shrub, and salt desert shrub communities on seleniferous clays and silts at 1170 to 1570 m in Emery, Garfield, Grand, Kane, San Juan and Wayne cos.; Arizona, Nevada, and California. Our materials belong to var. *latus* M. E. Jones, sens. str., which differ from the more western var. *preussii*, sens. str., in having a larger number of leaflets (17–25, not 11–15). Both (in sens. lat.) can be treated

conservatively as belonging to a polymorphic var. *preussii*; 54 (xxii).

Astragalus pubentissimus Torr. & Gray. Green River Milkvetch. [*A. multicaulis* Nutt. ex Torr. & Gray, not Ledeb.; *Tragacantha pubentissima* (Torr. & Gray) Kuntze; *Phaca pubentissima* (Torr. & Gray) Rydb.]. Perennial, or functionally annual, caulescent, 9–25 cm tall, from a rather weak caudex; pubescence basifixed; stems decumbent to ascending, radiating from the caudex; stipules 1–4.5 mm long, all distinct; leaves 2–8 cm long; leaflets 5–15, 2–14 mm long, 1.5–5 mm wide, oblong to ovate, obovate, or elliptic, obtuse to retuse, mucronate, or acute, villosulous on both sides; peduncles 1–3.5 cm long; racemes 3- to 12-flowered, the flowers spreading at anthesis, the axis 0.4–3.5 cm long in fruit; bracts 1–3 mm long; pedicels 0.5–2 mm long; bracteoles 0; calyx 4.8–6.3 mm long, the tube 2.8–4.2 mm long, campanulate, villosulous, the teeth 1.8–2.8 mm long, subulate; flowers 8.8–12.2 mm long, pink-purple or ochroleucous and suffused with purple; pods spreading-declined, sessile, inflated, obliquely lance-ellipsoid, 12–20 mm long, 4–8 mm thick, shaggy-pilose, unilocular; ovules 9–18.

- 1. Plants ascending to erect; flowers monochrome in populations *A. pubentissimus* var. *pubentissimus*
- Plants spreading-decumbent; flowers polychrome in populations *A. pubentissimus* var. *peabodianus*

Var. peabodianus (M. E. Jones) Welsh comb. nov. based on *Astragalus peabodianus* M. E. Jones Zoe 3:295. 1893. The Peabody phase of the Green River milkvetch occurs in entrenched channels cut into the escarpments draining the south and west flanks of the Tavaputs Plateaus, in pinyon-juniper and mixed desert shrub communities at 1300 to 1770 m in Emery and Grand (type from Thompson's Springs) cos.; endemic; 10 (ix).

Var. pubentissimus. The Green River milkvetch occurs in pinyon-juniper and mixed desert shrub communities at 1525 to 1925 m in Duchesne and Uintah cos.; Wyoming and Colorado. Reports of livestock poisoning, mainly of sheep, are at-

tributable to this species. In years when it is abundant, the plants constitute the principal forb in much of the lower middle reaches of the Uinta Basin, reminiscent of seeded alfalfa fields among the open juniper-pinyon woodlands; 16 (i).

Astragalus purshii Douglas ex Hook. Pursh Milkvetch. Perennial, acaulescent or subacaulescent, 4.5–13 cm tall, from thatch-clothed caudex branches; pubescence basifixed; stems 0–2 cm long; leaflets 5–17, 2–14 mm long, 1–7 mm wide, elliptic to oblanceolate, acute densely villous on both sides; peduncles 1.5–10.5 cm long; racemes 1- to 7-flowered, the flowers ascending at anthesis, the axis 0.3–2 cm long in fruit; bracts 2–7 mm long; pedicels 1–5 mm long;

bracteoles 0; calyx 12–16 mm long, the tube 8.5–12.5 mm long, cylindric, villous-pilose, the teeth 2.2–6 mm long, subulate; flowers 19–26 mm long, whitish to ochroleucous or pink-purple; pods ascending, sessile,

obliquely ovoid, usually curved, 13–26 mm long, 5–11 mm wide, shaggy-villous, unilocular; ovules 20–34. Two varieties are present in Utah.

- 1. Flowers whitish or ochroleucous, discolorous, the keel purple-tipped; plants of broad distribution in northernmost counties *A. purshii* var. *purshii*
- Flowers pink-purple, concolorous; plants rare in Box Elder and Rich cos. *A. purshii* var. *glareosus*

Var. *glareosus* (Douglas) Barneby. [*A. glareosus* Douglas ex Hook; *Tragacantha glareosa* (Douglas) Kuntze; *A. inflexus* var. *glareosus* (Douglas) M. E. Jones; *Phaca glareosa* (Douglas) Piper; *Xylophacos glareosus* (Douglas) Rydb.]. Sagebrush community at 1530 to 1830 m in Box Elder and Rich cos.; British Columbia south to Nevada. The var. *glareosus* simulates *A. utahensis* (q.v.) both in having pink-purple flowers and in habit. Leaflet shape and the flower structure are important diagnostic features; 2 (0).

Var. *purshii*. [*Tragacantha purshii* (Douglas) Kuntze; *Phaca purshii* (Douglas) Piper; *Xylophacos purshii* (Douglas) Rydb.; *A. purshii* var. *interior* M. E. Jones]. Sagebrush, desert shrub, and pinyon-juniper communities at 1530 to 2270 m in Box Elder, Duchesne, Rich, and Uintah cos.; Washington east to Alberta and Saskatchewan, and south to California, Nevada, Colorado, and South Dakota; 15 (ii).

***Astragalus racemosus* Pursh.** Alkali Milk-vetch. Perennial, caulescent, 20–53 cm tall, from a branching caudex; pubescence basifixed; stems erect or ascending, forming clumps; stipules 3–8 mm long, at least some connate-sheathing; leaves 4–15 cm long; leaflets 9–19, 3–35 mm long, 1.5–13 mm wide, lance-elliptic to linear-lanceolate, acute to acuminate, glabrous or glabrate on both surfaces, sometimes ciliate; peduncles 3–13 cm long; racemes 9- to 45-flowered, the flowers nodding at anthesis, the axis 5–20 cm long, in fruit; bracts 1.5–7.5 mm long; pedicels 2–8 mm long; bracteoles 0–2; calyx 8.6–12 mm long, the tube 5–6 mm long, short-cylindric, gibbous, glabrous or sparingly strigose, the teeth 3.3–6 mm long, subulate; flowers 14–17 mm long, ochro-

leucous, concolorous, or with the keel purple-tipped; pods pendulous, stipitate, the stipe 4–6 mm long, the oblong-ellipsoid body 10–21 mm long, 4–8 mm wide, triquetrous, glabrous, unilocular; ovules 12–22. Uinta and Duchesne River formations, rarely otherwise on saline clay and silty soils, at 1570 to 1970 m in Duchesne and Uintah cos; Wyoming. Our plants belong to var. *treleasei* C. L. Porter. They are primary selenium indicators. Consumption by cattle of this and other selenophyte results in a “alkali disease,” or “blind staggers.” Plants from along Hill Creek in Uintah Co. have concolorous flowers; those from elsewhere are discolorous; 26 (v).

***Astragalus rafaelsenis* M. E. Jones.** San Rafael Milkvetch. [*Cnemidophacos rafaelsenis* (M. E. Jones) Rydb.]. Perennial, caulescent, rush-like, 32–62 cm tall, from a branching caudex; pubescence basifixed; stems erect or ascending, arranged in clumps; stipules 1–5 mm long, at least some connate-sheathing; leaves 2.5–14.8 cm long, all simple, or some with leaflets 3–5, the lateral ones 3–20 mm long, 0.5–1.5 mm wide, linear to oblong, acute, glabrate beneath, glabrous above, the terminal leaflet longer and confluent with the rachis; peduncles 11–27 cm long; racemes loosely 5- to 12-flowered, the flowers ascending to declined in anthesis, the axis 2–15 cm long in fruit; bracts 1.2–3.5 mm long; pedicels 2–5.5 mm long; bracteoles 2; calyx 6–9.6 mm long, the tube 5.2–7.5 mm long, short-cylindric, thinly strigose to glabrate, the teeth (0.8) 1.1–2.1 mm long, triangular; flowers 19–26 mm long, pale pink-purple or bicolored; pods deflexed, sessile, oblong-elliptic in outline, 12–25 mm long, 5–7 mm

wide, laterally compressed, glabrous, leathery-woody, unilocular, ovules 18–20. Seleniferous clays and silts of the Buckhorn Conglomerate, Morrison, Summerville, Chinle, and Moenkopi formations at 1370 to 1625 m in salt desert shrub community in Emery Co.; endemic. There are two main populations; one at the east base of the Cedar Mountain and the other in the vicinity of Window-blind Butte in the San Rafael Swell proper. This is a handsome selenophyte with close affinities to *A. toanus* and *A. saurinus* (q.v.), and lesser affinities to *A. woodruffii* (q.v.) 17 (vii).

Astragalus sabulonum A. Gray. Gravel Milkvetch. [*Phaca sabulonum* (A. Gray) Rydb.; *A. virgineus* Sheldon]. Annual, winter annual, or biennial, caulescent, 4–30 cm tall, radiating from a taproot; pubescence basifixed; stems decumbent to ascending, rarely erect; stipules 1–4 mm long, all distinct; leaves 1.5–7 cm long; leaflets 9–15, 2–13 mm long, 1–5 mm wide, oblanceolate to oblong or obovate, retuse to truncate or obtuse, loosely villous or both surfaces or glabrate above; peduncles 0.5–4 cm long; racemes 2- to 7-flowered, the flowers ascending-spreading at anthesis, the axis 0.3–2 cm long in fruit; bracts 1–2.5 mm long; pedicels 0.8–2 mm long; bracteoles 0; calyx 3.8–5.5 mm long, the tube 1.8–2.5 mm long, campanulate, hirsutulous, the teeth 1.8–3 mm long, subulate; flowers 6.2–8 mm long, pink-purple or less commonly ochroleucous and tinged with purple; pods spreading-declined, sessile, obliquely ovoid, inflated, 9–17 mm long, 5–8 mm thick, curved, white-hirsutulous, unilocular; ovules 10–19. Mixed desert shrub, salt desert shrub, and lower pinyon-juniper communities, often in sand, at 1130 to 1700 m in Emery, Grand, Kane, San Juan, and Wayne cos.; California, Nevada, Arizona, and New Mexico. The gravel milkvetch is a near ally of *A. pardalinus* (q.v.), with which it is at least partially sympatric, and of *A. pubentissimus* whose geographical range is apparently distinct; 21 (vii).

Astragalus sabulosus M. E. Jones. Cisco Milkvetch. [*Jonesiella sabulosa* (M. E. Jones) Rydb.]. Perennial, caulescent, 13–38 cm tall, from a woody caudex; pubescence basifixed;

stems decumbent to ascending or erect, forming clumps; stipules 4–9 mm long, all distinct; leaves 3–10.5 cm long; leaflets 5–11, 6–35 (50) mm long, 3–17 mm wide, rhombic-oval to obovate or elliptic, mucronate, strigose to glabrous on both sides; peduncles 3.5–7 cm long; racemes 4- to 10-flowered, the flowers ascending-spreading at anthesis, the axis 0.5–2 cm long in fruit; bracts 2–6 mm long; pedicels 2–5 mm long; bracteoles 0–2; calyx 15–17.5 mm long, the tube 11.5–14 mm long, cylindric, strigulose, the teeth 3–4 mm long, subulate; flowers 28.5–34 mm long, whitish to ochroleucous, fading yellowish; pods spreading to declined, subsessile, inflated, cylindroid, 20–48 mm long, 10–15 mm thick, stiffly papery to leathery, strigose, unilocular; ovules 55–59. Salt desert shrub at 1300 to 1600 m on Mancos Shale east of Thompson in the Grand River Valley in Grand Co.; endemic. The Cisco milkvetch is a primary selenium indicator with close affinities to *A. iselyi* (q.v.), from which it can be distinguished by its larger yellowish flowers. The Cisco milkvetch is also allied with *A. praelongus* which has much smaller flowers and pods. The flowers of *A. sabulosus* are the largest within *Astragalus* in Utah, and possibly elsewhere (though they may not be the longest); 9 (vi).

Astragalus saurinus Barneby. Dinosaur Milkvetch. Perennial, caulescent, rush-like, 25–45 cm tall, from a shallowly subterranean caudex; pubescence basifixed; stems erect or ascending, arranged in clumps; stipules 1.2–7 mm long, usually at least some shortly connate-sheathing; leaves 2.5–9 cm long, the uppermost usually simple, the others with leaflets 3–9, mostly 10–28 mm long, 0.5–2 mm wide, linear to linear-elliptic, obtuse to acute, strigose on both surfaces, the terminal leaflet confluent with the rachis; peduncles 7–21 cm long; racemes 3- to 15-flowered, the flowers ascending-spreading at anthesis, the axis 0.5–6 cm long in fruit; bracts 1.2–2 mm long; pedicels 1.5–3 mm long; bracteoles 1–2; calyx 6.4–9.6 mm long, the tube 5.6–6.7 mm long, cylindric, the teeth 0.9–2.9 mm long, triangular-subulate; flowers 18–22 mm long, bicolored, pink-purple,

with white wing-tips, rarely all white; pods deflexed, sessile or nearly so, narrowly oblong in outline, straight or curved, 15–35 mm long, 4.4–6 mm wide, laterally compressed, strigose to glabrate, unilocular; ovules 19–29. Duchesne River, Morrison, Carmel, Chinle, and Moenkopi formations in salt desert shrub and pinyon-juniper communities at 1430 to 1700 m in Uintah Co.; endemic. The dinosaur milkvetch is a primary selenophyte with two near congeners in Utah; *A. toanus* of far western Utah, and *A. rafaelensis* of the San Rafael Swell; 17 (vi).

***Astragalus scopulorum* T. C. Porter.** Rocky Mountain Milkvetch. [*Tragacantha scopulorum* (T. C. Porter) Kuntze; *Tium scopulorum* (T. C. Porter) Rydb.]. Perennial, caulescent, 15–48 cm tall, from a shallowly subterranean caudex; pubescence basifixed; stems decumbent to ascending, radiating from the caudex; stipules 3–9 mm long, at least some connate-sheathing; leaves 1.5–8.5 cm long; leaflets 15–29, 2–18 mm long, 1–8 mm wide, oblong to elliptic or oblanceolate, some narrowly so, acute to obtuse or mucronate, thinly strigose to glabrous beneath, glabrous above, thinly ciliate; peduncles 2–14 cm long; racemes 4- to 22-flowered, the flowers declined to nodding at anthesis, the axis 1–7 cm long in fruit; bracts 1.5–7 mm long; pedicels 1–4 mm long; bracteoles 0–2; calyx 9–11.5 mm long; the tube 6.8–8.5 mm long, subcylindric, strigulose, the teeth 1.5–3.5 mm long; flowers 18–24 mm long, ochroleucous, concolorous or the keel faintly purplish; pods pendulous, stipitate, the stipe 4–9 mm long, the body oblong, straight or curved, 18–35 mm long, 3–6.5 mm wide, triquetrous, glabrous, bilocular. Mountain brush, sagebrush, ponderosa pine, pinyon-juniper and aspen-white fir communities at 1670 to 2430 m in Carbon, Grand, eastern Millard, San Juan, Sanpete, Sevier, Summit, Utah, and Wasatch cos.; Colorado, Arizona, and New Mexico. Continued exploration of the plateaus and mountain ranges of central and northern Utah has demonstrated a large area occupied by this distinctive milkvetch of middle elevation brush and woodland; 29 (ix).

***Astragalus serpens* M. E. Jones.** Plateau Milkvetch. [*Phaca serpens* (M. E. Jones) Rydb.]. Perennial, caulescent, 3.5–23 cm long, radiating from a weak caudex; pubescence basifixed; stems decumbent to ascending-erect; stipules 1.5–3.5 mm long, all distinct; leaves 1.5–4.5 cm long; leaflets 9–15, 2–9 mm long, 1–4 mm wide, obovate to oblanceolate or elliptic, obtuse to emarginate, strigose-pilous beneath and above, or glabrate above; peduncles 0.7–2.5 cm long; racemes shortly 2- to 9-flowered, the flowers spreading at anthesis, the axis 0.2–0.8 cm long in fruit; bracts 1–1.5 mm long; pedicels 1–1.8 mm long; bracteoles 0; calyx 4.2–5 mm long, the tube 2.7–3.5 mm long, campanulate, white strigulose (some black hairs sometimes present), the teeth 1.5–2 mm long, subulate; flowers 6.6–8.6 mm long, purplish to pink-purple or whitish; pods ascending to declined, stipitate, the stipe (gynophore) 0.7–1.5 mm long, the body bladdery-inflated, ovoid or ellipsoid, 13–29 mm long, 7–17 mm wide (when pressed), red-mottled, strigose, unilocular. Sagebrush, pinyon-juniper, aspen, and aspen-fir communities at 2070 to 2800 m in Garfield, Kane, Iron, Piute, and Wayne cos.; endemic. Barneby (1964) places *A. serpens* adjacent to *A. pubentissimus*, a near congener of *A. sabulorum* and *A. pardalinus*. The similarity to *A. perianus* was discounted, but examination of both species in the field and in the herbarium indicates that the nearest ally of *A. serpens* is *A. perianus*, despite the morphological differences noted by Barneby (i.e., the sessile pod, subterranean root-crown, and connate stipules) for *A. perianus*. In some years *A. serpens* is abundant in the Loa Pass vicinity where it occupies spaces between low sagebrush and igneous gravel; 19 (iii).

***Astragalus sesquiflorus* S. Wats.** Sandstone Milkvetch. [*Tragacantha sesquiflora* (S. Wats.) Kuntze; *Batidophaca sesquiflora* (S. Wats.) Rydb.; *A. sesquiflorus* var. *brevipipes* Barneby]. Perennial, caulescent, prostrate, often mat-forming, 0.5–5 cm tall, radiating from a branching caudex; pubescence malpighian; stems 5–28 cm long or more; stipules 1.5–4.5 mm long, all connate-sheathing; leaves 1–4 cm long; leaflets

7–13, 1.5–10 mm long, 0.6–2 mm wide, elliptic to obovate, acute to obtuse, strigose on both sides (commonly involute); peduncles 0.8–4.5 cm long; racemes 1- to 4-flowered, the flowers ascending at anthesis, the axis very short in fruit; bracts 1.2–3 mm long; pedicels 0.7–4 mm long; bracteoles 0–2; calyx 3.7–5.5 mm long, the tube 1.5–2.8 mm long, campanulate, strigulose, the teeth 1.9–3 mm long, subulate; flowers 6–8 mm long, pink-purple; pods spreading-ascending, sessile or subsessile, the body obliquely oblong in outline, 8–10 mm long, 3–4 mm wide, trigonously compressed, strigulose, mixed desert shrub, pinyon-juniper, and ponderosa pine or aspen communities at 1570 to 2930 m in Kane, San Juan, and disjunctly (accidentally?) in Sanpete cos.; Arizona; a Mohave–San Juan endemic. The sandstone milkvetch is more closely allied to *A. humistratus* than to other species of milkvetch in Utah; 21 (iv).

***Astragalus spatulatus* Sheldon.** Draba Milkvetch. [*Homalobus caespitosus* Nutt.; *A. caespitosus* (Nutt.) A. Gray, not Pallas; *Tragacantha caespitosa* (Nutt.) Kuntze; *A. simplicifolius* var. *spatulatus* (Sheldon) M. E. Jones; *H. canescens* Nutt. ex Torr. & Gray; *H. brachycarpus* Nutt. ex Torr. & Gray; *A. simplex* Tidestr., not *A. brachycarpus* MB.; *A. spatulatus* var. *simplex* Tidestr.; *H. uniflorus* Rydb.; *A. spatulatus* var. *uniflorus* (Rydb.) Barneby]. Perennial, acaulescent, 1.5–9 cm tall, from a branching caudex; pubescence malpighian; stems obscured by marcescent leaf bases and stipules, tufted, sometimes mat-forming; stipules 2–7 mm long, all connate-sheathing; leaves all or mostly all simple (reduced to phyllodia), 0.8–6 cm long, only rarely with leaflets 3–5 on some leaves and with the terminal one confluent with the rachis, oblanceolate to linear, acute, mucronate, or spinulose, strigose on both surfaces; peduncles 0.4–7 cm long; racemes 1- to 11-flowered, the flowers ascending at anthesis, the axis 0.2–3 cm long in fruit; bracts 0.6–3 mm long; calyx 2.6–5 mm long, the tube 1.9–3.4 mm long, campanulate, strigose, the teeth 0.5–2.5 mm long, subulate; flowers 5.7–9.5 mm long, pink-purplish to ochroleucous or whitish (in populations); pods

erect, sessile, lanceolate to lance-oblong in outline, 4–13 mm long, 1.5–3 mm wide, straight or slightly curved, strigose to rarely glabrous, unilocular; ovules 4–12. Pinyon-juniper, sagebrush, and mountain brush communities, often on exposed ridges, at 1530 to 2630 m in Cache, Carbon, Daggett, Duchesne, Emery, Grand, Rich, Uintah, and Wasatch cos. (to be expected in Sanpete and Summit); Alberta and Saskatchewan, south to Idaho, Colorado, and Nebraska. The draba milkvetch is most closely allied to *A. chloodes* and *A. detritalis* among our species; 35 (x).

***Astragalus straturensis* M. E. Jones.** Silver Reef Milkvetch. [*Atelophragma straturense* (M. E. Jones) Rydb.; *Hamosa atrata* Rydb., type from southern Utah; *Tium atratiforme* (Rydb.) Rydb.]. Perennial, caulescent, 13–36 cm tall, from a superficial to shallowly subterranean caudex; pubescence basifixed; stems decumbent to ascending or erect, forming clumps; stipules 1–2.5 mm long, all distinct; leaves 3.5–9.5 cm long; leaflets 9–19, 3–13 mm long, 1–5 mm wide, oblong to linear or oval, obtuse or retuse, strigose beneath, glabrous above; peduncles 1.5–7.5 cm long; racemes 9- to 25-flowered, the flowers ascending to declined at anthesis, the axis 1.5–14 cm long in fruit; bracts 0.8–1.5 mm long; pedicels 0.8–1.5 mm long; bracteoles 0; calyx 3.5–4.2 mm long, the tube 2.5–3.5 mm long, campanulate, strigose, the teeth 0.7–1 mm long, triangular; flowers 6.5–8.5 mm long, pink-purple with white wing-tips; pods pendulous, stipitate, the stipe 1.4–2 mm long, the body oblong in outline, curved or straight, 10–15 mm long, 2.2–3 mm wide, strigose, bilocular; ovules 10–13. Sagebrush, pinyon-juniper, and mountain brush communities at 1530 to 2130 m in Beaver, Iron, southeastern Millard, and Washington (type from Silver Reef) cos.; Arizona and Nevada. The Silver Reef milkvetch has no close relatives in the milkvetch flora of Utah. In flower size and general habit, it resembles *A. wingatanus* of southeastern Utah, but the resemblance is only superficial; 10 (iii).

***Astragalus striatiflorus* M. E. Jones.** Escarpment Milkvetch. Perennial, subacaulescent to short-caulescent, 1.5–6 cm

tall, radiating from a branching, usually subterranean caudex; pubescence basifixed; stems 0–5 cm long, only the tips produced above the sand; stipules 2–4 mm long, all connate-sheathing; leaves 1–4 cm long; leaflets 5–13, 1–7 mm long, 0.8–2.5 mm wide, ovate to obovate or oblanceolate, obtuse, mucronate, or emarginate, pilosulous; peduncles 1–3 cm long; racemes 2- to 5-flowered, the flowers ascending in anthesis, the axis 0.2–1 cm long; pedicels 1–1.5 mm long; bracteoles 0; calyx 5.5–7 mm long, the tube 3–4 mm long, campanulate, hirsutulous, the teeth 1.8–3 mm long, subulate; flowers 9–12 mm long, pink-purple or whitish and commonly suffused with purple, the keel-tip purple, long-attenuated, with the stigma protruding; pods spreading, sessile, the body bladdery-inflated, ellipsoid, 12–18 mm long, 8–15 wide (when pressed), mottled, spreading-hairy, bilocular. Interdune valleys, sandy depressions on ledges, and bars and terraces in stream channels at 1530 to 1900 m in Kane (from the Paria River westward) and eastern Washington cos.; Coconino Co., Arizona. The escarpment milkvetch is a singular plant, resembling *A. perianus* more closely than any other in Utah. The attenuate keel-tip, protruding stigma, and inflated bilocular pods are both unusual and diagnostic features; 12 (iv).

Astragalus subcinereus A. Gray. Silver Milkvetch. [*Phaca subcinerea* (Gray) Rydb.; *A. sileranus* M. E. Jones, type from Sink Valley (near Alton); *Phaca silerana* (M. E. Jones) Rydb.; *A. sileranus* var. *cariacus* M. E. Jones, type from Elk Head Ranch on the upper Virgin River]. Perennial, caulescent, prostrate, 14–90 cm long, radiating from a

subterranean branching caudex; pubescence basifixed; stems prostrate to weakly ascending; stipules 1.5–6.5 mm long, at least some connate-sheathing; leaves 1.5–8.5 cm long; leaflets 9–23, 2–16 mm long, 1–8.5 (10) mm wide, oblong to oblanceolate or obovate, obtuse, emarginate, or retuse, villosulous on both surfaces, or glabrate above; peduncles 1.5–10 cm long; racemes 5- to 37-flowered, the flowers ascending to declined at anthesis, the axis 1–7 cm long in fruit; bracts 1–3 mm long; pedicels 0.5–2.5 mm long; bracteoles 0–1; calyx 3.4–6.3 mm long, the tube 2.3–3.6 mm long, campanulate, villosulous, the teeth 0.9–2.9 mm long, subulate; flowers 6–11 mm long, ochroleucous and commonly suffused with purple; pods spreading to declined, subsessile, inflated, ovoid-ellipsoid to ellipsoid, 12–27 mm long, (3.5) 6–13 mm wide (when pressed), subterete to dorsiventrally compressed, thinly villosulous, mottled; ovules 10–20. Barneby (1964: 214) discussed the variation within *A. subcinereus* sens. lat. noting the morphological variants in each major segment of the species at large. Much of the material from Kane, Garfield, and Washington counties differs from the typical plants in Mohave County, Arizona in being more leafy (the leaflets 4–10 mm broad), in having longer stems (3–7 dm long), and in having more firmly walled pods 15–28 mm long and 6–10 (13) mm thick. These Utah plants belong, sens. str., to var. *cariacus* M. E. Jones, but the features are weak and overlapping at best. There is another variant, not seen by Barneby, that is seemingly worthy of taxonomic recognition. It is separable as follows:

- 1. Mature pods elliptic-oblong to oblong, 3.5–5.5 mm wide; flowers 8.5–11 mm long; stems 40–90 cm long; plants of volcanic gravels in eastern Sevier and Emery cos. *A. subcinereus* var. *basalticus*
- Mature pods ovoid-ellipsoid, 6–13 mm wide; flowers 6–9 mm long; stems mostly 14–70 cm long; plants commonly of sedimentary gravels, sometimes from igneous gravels, but not in Sevier or Emery cos.
..... *A. subcinereus* var. *subcinereus*

Var. *basalticus* Welsh var. nov. *Astragalus subcinereus* var. *subcinereus* aemulans, differt leguminibus angustioribus (3.5–5.5 mm, nec

6–13 mm), floribus magnioribus (8.5–11 mm, nec 6–9 mm), et caulis longioribus (40–90 cm, nec 14–70 cm). Holotype. Utah,

Sevier Co., open pine woodland adjacent to Utah Highway #72, ca. 10 miles south of junction with Utah Highway #4, Welsh, Isely, Moore 6447, 23 July 1967 (BRY). Paratypes: Utah, Emery Co., 7 mi S of I-70, Road to Baker Ranch, Welsh 14788, 18 May 1977 (BRY); Sevier Co., igneous bouldery slope with juniper, along Utah Highway #72, 5 miles south of junction with Utah Highway #4, Welsh, Isely, Moore 6445, 23 July 1967 (BRY) 12 mi due SSW of Emery, Welsh & Clark 16186, 23 Aug 1977 (BRY). The plants grow at 1830 to 2430 m in pinyon-juniper and sparse ponderosa pine woods in Emery and Sevier cos.; endemic; 4 (iv).

Var. *subcinereus*. Ponderosa pine, pinyon-juniper, and sagebrush communities at 1670 to 2270 m in Garfield, Iron, Kane, and Washington cos.; Lincoln Co., Nevada, and Mohave and Coconino cos.; Arizona; 13 (ii).

***Astragalus tenellus* Pursh.** Pulse Milk-vetch. [*Ervum multiflorum* Pursh; *Homalobus multiflorus* (Pursh) Nutt. ex Torr. & Gray; *A. multiflorus* (Pursh) A. Gray; *Tragacantha multiflora* (Pursh) Kuntze; *H. tenellus* (Pursh) Britton in Britton & Brown; *H. strigosus* Rydb.; *A. tenellus* f. *strigosus* (Rydb.) Macbr.; *A. tenellus* var. *strigosus* (Rydb.) F. J. Hermann]. Perennial, caulescent, 10–52 cm tall, from a branching caudex; pubescence basifixed; stems erect, ascending, or less commonly decumbent, forming clumps; stipules 1.5–7 mm long, turning black in drying, at least some connate-sheathing; leaves 2–9 cm long; leaflets 11–21, 3–24 mm long, 0.4–6 mm wide, narrowly oblong to elliptic, linear, oblanceolate or obovate, acute to obtuse, mucronate, or emarginate, thinly strigose beneath, glabrous above; peduncles 0.2–4 cm long, often paired; racemes (1) 3- to 23-flowered, the flowers ascending at anthesis, the axis 0.5–11 cm long in fruit; bracts 0.5–2.7 mm long; pedicels 0.7–3.2 mm long; bracteoles 0–2; calyx 2.6–5.2 mm long, the tube 2–2.7 mm long, campanulate, strigose, the teeth 0.7–2.5 mm long; flowers 6–9 mm long, white to ochroleucous; pods pendulous, stipitate, the stipe 0.6–5.5 mm long, the body elliptic to oblong in outline, straight or curved, 7–16 mm long, 2.5–4.5 mm

wide, laterally flattened, glabrous or less commonly strigose, unilocular; ovules 3–9. Mountain brush, sagebrush, pinyon-juniper, ponderosa pine, aspen-fir, and spruce-fir communities at 1670 to 2900 m in Box Elder, Cache, Carbon, Daggett, Duchesne, Emery, Garfield, Grand, Iron, Millard, Piute, Sanpete, Sevier, Summit, Uintah, Utah, Wasatch, and Wayne cos.; Yukon east to northern Manitoba and south to Nevada, New Mexico, Nebraska, and Minnesota. The pulse milkvetch is similar to many salient morphological features to *A. wingatanus*, but the subterranean caudex, habit of growth, and elongated fruiting racemes of that species indicate affinities elsewhere, even though the fruit and the tiny flowers are similar; 90 (xx).

***Astragalus tephrodes* A. Gray.** Ashen Milkvetch. [*A. shortianus* var. *brachylobus* A. Gray; *Xylophacos brachylobus* (A. Gray) Rydb.; *A. curtislobus* Tidestr., not *A. brachylobus* DC.]. Perennial, acaulescent to short-caulescent, 5–15 cm tall, from a branching caudex; pubescence basifixed; stems 0–8 cm long, the internodes commonly obscured by stipules; stipules 2–11 mm long, all distinct, or rarely some shortly connate-sheathing; leaves 4–16 cm long; leaflets 11–31, 3–17 mm long, 2–11 mm broad, obovate to oblanceolate, elliptic, or orbicular, obtuse, acute, or emarginate, strigulose to pilosulous on both sides or glabrous above; peduncles 4–15 cm long; racemes 10- to 25-flowered the flowers ascending at anthesis, the axis 1.5–8 cm long in fruit; bracts 1.5–9 mm long; pedicels 0.6–3.4 mm long; bracteoles 0; calyx 8.8–12.7 mm long, the tube 7.1–10 mm long, cylindric, pilosulous, the teeth 1.7–2.8 mm long, subulate; flowers 15–24 mm long, pink-purple; pods ascending, ellipsoid to lance-ellipsoid, 17–30 mm long, 6–10 mm thick, strigulose to pilosulous, unilocular; ovules 24–35. Known in Utah with certainty only on the basis of a collection reported by Barneby (1964) from Washington Co. (Springdale, Jones in 1894, POM); California, Arizona, and New Mexico. Our material reportedly belongs to var. *brachylobus* (A. Gray) Barneby.

***Astragalus tetrapterus* A. Gray.** Four-wing Milkvetch. [*Pterophacos tetrapterus* (A.

Gray) Rydb.]. Perennial, caulescent, 10–35 cm tall, from a subterranean caudex; pubescence basifixed; stems erect or ascending, or finally decumbent; stipules 2–5.5 mm long, all distinct; leaves 1.5–8.5 cm long; leaflets 9–21, 1–33 mm long, 0.3–3.2 mm wide, linear, narrowly oblong, or elliptic, obtuse to acute, strigose to glabrous on both sides, at least some terminal leaflets confluent with the rachis in uppermost leaves; peduncles 1–6.5 cm long; racemes 6- to 15-flowered, the flowers ascending at anthesis, the axis 1–4 cm long in fruit; bracts 1.5–3.5 mm long; pedicels 1.4–4.3 mm long; bracteoles 0–2; calyx 5.5–8.7 mm long, the tube 4.7–7 mm long, cylindric, strigose, the teeth 0.8–2.8 mm long, subulate; flowers 15–19 mm long, white to yellowish tinged faintly with pink, the keel faintly purple-tipped; pods pendulous, sessile, obliquely oblong in outline, curved or coiled, 20–40 mm long, 6–10 mm wide, succulent at first, ultimately (by collapse of fleshy walls), sharply 4-angled, glabrous or strigose, unilocular; ovules 28–38. Pinyon-juniper and sagebrush communities at 1030 to 2130 m in Beaver, Iron, Kane, and Washington (type from 25 miles north of St. George) cos.; Oregon, Nevada, and Arizona. The four-wing milkvetch has been reported to produce locoism in livestock, but it is seldom sufficiently abundant to produce serious, large-scale losses; 9 (iii).

Astragalus toanus M. E. Jones. Toana Milkvetch. [*Cnemidophacos toanus* (M. E. Jones) Rydb.]. Perennial, caulescent, rush-like, 15–50 cm tall, from shallowly subterranean to superficial caudex; pubescence basifixed; stems erect or ascending, in clumps; stipules 1.5–6.5 mm long, at least some connate-sheathing; leaves 2–10 cm long, the uppermost, rarely all, simple, or with the terminal leaflet confluent with the rachis, the lower ones with leaflets 3–9, 3–30 mm long, 1.4–2.5 mm wide, linear-filiform to oblong, obtuse to acute, strigose or glabrous on both sides; peduncles 6–25 cm long; racemes 7- to 35-flowered, the flowers ascending at anthesis, the axis 3–30 cm long in fruit; bracts 1–3 mm long; pedicels 0.8–3.5 mm long; bracteoles 0–2; calyx 4.6–8 mm long, the tube 4.1–6.4 mm long,

short-cylindric, strigose, the teeth 0.5–2 mm long, subulate; flowers 15–20 mm long, pink-purple with wing-tips white; pods erect, sessile, oblong in outline, 13–25 mm long, 3.7–5.5 mm wide, slightly compressed laterally glabrous to strigose, unilocular; ovules 14–26. Seleniferous clay soils in salt desert shrub communities at 1530 to 1770 m in Box Elder and Millard cos.; Nevada, Oregon, and Idaho. The Toano milkvetch has affinities with both *A. saurinus* of the Uinta Basin, and *A. rafaensis* of the San Rafael Swell. No intermediates are known; 12 (i).

Astragalus utahensis (Torr.) Torr. & Gray. Utah Milkvetch. [*Phaca millissima* var. *utahensis* Torr. in Stansbury; *Tragacantha utahensis* (Torr.) Kuntze; *Xylophacos utahensis* (Torr.) Rydb.]. Perennial, subcaulescent, mostly 2–12 cm tall, radiating from a branching caudex; pubescence basifixed; stems 0–10 cm long, the internodes usually concealed by stipules, prostrate; stipules 3–10 mm long, all distinct; leaves 1.5–12 cm long; leaflets 9–19, 2–15 mm long, 2–12 mm wide, obovate or sub-orbicular to ovate, obtuse to emarginate, rarely acute, densely villous-tomentose on both surfaces; peduncles 1–14 cm long; racemes 2- to 8-flowered, the flowers ascending at anthesis, the axis 0.4–2.6 cm long in fruit; bracts 4–9 mm long; pedicels 2–4.3 mm long; bracteoles 0–2; calyx 12–14 mm long, the tube 8.5–13 mm long, cylindric, villous-tomentose, the teeth 2–4.5 mm long, lance-subulate; flowers 23–31 mm long, pink-purple (rarely white); pods ascending, sessile or stipitate, the stipe (gynophore) 1–2.5 mm long, the body 17–30 mm long, 5.5–7.5 mm wide, obscured by long shaggy-villous hairs, unilocular; ovules 22–31. Sagebrush, pinyon-juniper, mountain brush, and grassland communities at 1250 to 2130 m in all Utah counties except Daggett, Emery, Grand, Iron (to be expected), Kane, Rich, San Juan, and Uintah; Idaho and Nevada. The Utah milkvetch is known locally as “ladysslipper,” because of a fancied resemblance of the large flowers to softly cushiony house-slippers. The plants are abundant along the Wasatch front, where they flower in April and May, much to the

delight of beginning students in taxonomy, each of whom feels compelled to collect at least one plant and deposit it in a herbarium; 163 (xii).

Astragalus wardii A. Gray. Ward Milk-vetch. [*Phaca wardii* (A. Gray) Rydb.]. Perennial, caulescent, 9–50 cm tall, from a branching, superficial (rarely subterranean) caudex; pubescence basifixed; stems decumbent to erect; stipules 1–3 mm long, all distinct; leaves 3–10 cm long; leaflets 17–23, 3–11 mm long, 0.8–6 mm wide, oblanceolate to elliptic or narrowly oblong to linear, obtuse to retuse or emarginate, strigose only on the midrib beneath and on margins; peduncles 1.5–5 cm long; racemes loosely 5- to 15-flowered, the flowers ascending to declined at anthesis, the axis 1–5 cm long in fruit; bracts 1–2.2 mm long; pedicels 1–3.4 mm long; bracteoles 0–2; calyx 2.9–4.6 mm long, the tube 1.7–2.3 mm long, campanulate, strigose with black, less commonly black mixed with white, hairs, the teeth 1–2.4 mm long, subulate; flowers 5–8 mm long, whitish or ochroleucous; pods pendulous to spreading, sessile or on a gynophore about as broad as long, bladdery-inflated, 15–28 mm long, 9–17 mm wide (when pressed), mottled or not, glabrous, unilocular; ovules 12–17. Sagebrush, cottonwood, pinyon-juniper, ponderosa pine and spruce-fir communities, or less commonly in grassland and salt desert shrub communities, at 1530 to 2730 m in Garfield, Kane, Piute, and Sevier cos.; endemic. The Ward milk-vetch is similar in its inflated, unilocular pods, distinct stipules, and small flowers with the closely contiguous, if not sympatric, *A. serpens*, from which it can be distinguished by the more numerous leaflets, predominately black strigose calyces, and glabrous pods. The presence of an incipient gynophore in *A. wardii* strengthens the similarity between these distinctive species; 24 (ii).

Astragalus wetherillii M. E. Jones. Wetherill Milkvetch. [*Phaca wetherillii* (M. E. Jones) Rydb.]. Perennial, caulescent, 4–26 cm tall, from a branching caudex; pubescence basifixed; stems decumbent to ascending, in clumps; stipules 1.2–3.5 mm long, all distinct; leaves 2–10 cm long; leaf-

lets 7–15, 3–14 mm long, 2–9 mm wide, obovate to oval, obtuse to emarginate or mucronate, thinly strigose beneath, glabrous above; peduncles 1.5–4.5 cm long; racemes 2- to 9-flowered, the flowers ascending to declined at anthesis, the axis 0.3–2.3 mm long in fruit; bracts 1–2.5 mm long; pedicels 1–2.5 mm long; bracteoles 0; calyx 4.6–6.2 mm long, the tube 2.8–3.8 mm long, campanulate, strigose, the teeth 1.8–2.4 mm long, subulate; flowers 7.5–11 mm long, whitish or tinged lavender; pods spreading to declined or shortly stipitate, the stipe (gynophore) 1–2.5 mm long, the body inflated, ovoid-ellipsoid, slightly curved, 14–22 mm long, strigulose, unilocular; ovules 9–13. Mountain brush and pinyon-juniper communities at 1430 to 1770 m in Grand Co. (collected by Eastwood according to Jones 1923); central western Colorado. The Utah collection is known from the canyon of the Colorado River east of Moab. It has not been recollected in many years, but likely it persists along the canyon slopes on the shaded side. It is a peculiar species, not quite like any other known from Utah. The pods of early produced flowers are often mature and brown while progressively younger pods and flowers continue to be produced as the plants elongate; 2 (ii, both from Colorado).

Astragalus wingatanus S. Wats. Fort Wingate Milkvetch. [*Homalobus wingatanus* (S. Wats.) Rydb.; *A. dodgeanus* M. E. Jones, type from Thompson's Springs; *A. wingatanus* var. *dodgeanus* (M. E. Jones) M. E. Jones]. Perennial, caulescent, 15–45 (60) cm tall, from a subterranean caudex; pubescence basifixed; stems spreading-ascending, forming diffuse clumps; stipules 1.5–5 mm long, at least some connate-sheathing; leaves 1.5–6.5 cm long; leaflets 7–15 (17) 3–18 mm long, 0.4–3.6 mm wide, linear to narrowly oblong, elliptic or oblanceolate, acute, obtuse, or retuse, strigose to glabrous beneath, glabrous above, often ciliate; peduncles 2–14 cm long; racemes very loosely 7- to 35-flowered, the flowers ascending at anthesis, the axis 3–18 cm long in fruit; bracts 0.5–2 mm long; pedicels 0.8–3 mm long; bracteoles 0–2; calyx 2.5–3.7 mm long, the tube 1.5–2.6 mm long,

campanulate, strigose, the teeth 0.4–1.4 mm long, triangular-subulate; flowers 5.5–8 mm long, pink-purple, the wing-tips white or pale; pods deflexed, sessile or short-stipitate, the stipe to 1.7 mm long, the body elliptic to oblong in outline, straight or slightly curved, 9–15 mm long, 3–4.5 mm wide, compressed, glabrous, unilocular; ovules 4–8. Pinyon-juniper, mixed desert shrub, salt desert shrub, and less commonly in mountain brush communities at 1530 to 2130 m in Carbon, Duchesne, Emery, Grand, and San Juan cos.; Colorado, New Mexico, and Arizona. The Fort Wingate milkvetch simulates *A. tenellus* (q.v.), in its small flowers and laterally flattened pods. The buried caudex and elongated fruiting racemes are diagnostic for *A. wingatanus*, and indicate relationships elsewhere (i.e., with scytocarpous taxa such as *A. flexuosus* var. *diehlii*); 29 (xii).

Astragalus woodruffii M. E. Jones. Woodruff Milkvetch. [*Homalobus woodruffii* (M. E. Jones) Rydb.]. Perennial, caulescent, rush-like, 25–55 (65) cm tall, from a deeply subterranean caudex; pubescence basifixed or incipiently malpighian; stems erect or ascending in broom-like clumps; stipules 10–25 mm long, at least some usually connate-sheathing; leaves 1.5–6.5 (8) cm long, at least the upper ones simple, the others with decurrent leaflets 2–9, 2–17 mm long, 0.5–2 mm wide, acute to obtuse, silvery-strigose on both surfaces, the terminal leaflet decurrent also; peduncles 3.5–16 cm long; racemes 8- to 45-flowered, the flowers ascending at anthesis, the axis 2–25 cm long in fruit; bracts 2.5–7 mm long; pedicels 1–5 mm long; bracteoles 0–2; calyx 7.2–10.9 mm long, the tube 4.2–6.6 mm long, short-cylindric, pilosulous, the teeth 2.7–6 mm long, lance-subulate; flowers 12–19 mm long, pink-purple with pale or white wing-tips; pods erect, sessile, oblong in outline, straight to slightly curved, 14–20 mm long, 3.5–4.8 mm wide, laterally compressed, strigose, unilocular. Seleniferous, sandy or sandy-silts with sandloving desert shrubs at 1330 to 1670 m in southeastern Emery (type from San Rafael Swell), eastern Garfield and Wayne cos.; endemic. The Woodruff milkvetch has affinities with *A.*

rafaelensis, *A. saurinus*, and *A. toanus*, but has been placed in a section by itself by Barneby (1964: 436). The species was described by Jones (1923: 78) as being “the most beautiful species of the genus when the whole mass is ablaze with pink-purple bloom.” The plant is a primary selenium indicator; 21 (vii).

Astragalus zionis M. E. Jones. Zion Milkvetch. [*Xylophacos zionis* (M. E. Jones) Rydb.]. Perennial, subcaulescent or short-caulescent, 3–23 cm tall, from a branching caudex, this sometimes clothed with a persistent thatch of leaf bases; pubescence basifixed; stems 0–11 cm long, prostrate to ascending, the internodes often concealed by stipules; stipules 1.5–5.5 mm long, all distinct or some shortly connate-sheathing; leaves mostly 2–15 cm long; leaflets 13–25, 2–16 mm long, 1–6 mm wide, elliptic or ovate, acute or less commonly obtuse, silvery villous on both sides; peduncles 0.5–15 cm long; racemes 1- to 11-flowered, the flowers ascending at anthesis, the axis 0.3–6 cm long in fruit; bracts 2–5 mm long; pedicels 1–3 mm long; bracteoles 0–2; calyx 8.3–18 mm long, the tube 6.5–12.7 mm long, cylindric, villous, the teeth 1.5–5.7 mm long, subulate; flowers 18–26 mm long, pink-purple or sometimes pale; pods ascending, sessile, obliquely ovoid-oblong in outline, 15–30 mm long, 5.5–9 mm wide, usually curved, dorsiventrally compressed, strigose or villosulous, brightly mottled, usually unilocular; ovules 24–30. On sandstone and in sandy and gravelly soils in mixed desert shrub, mountain brush, and riparian communities at 1130 to 2430 m in Garfield, Kane, San Juan, and Washington cos.; Arizona. The Zion milkvetch is allied to *A. argophyllus* from which it differs in the connate stipules and brightly mottled pods. The habitat of *A. argophyllus* is seldom situated in sand, while that of *A. zionis* is almost exclusively restricted to it; 31 (vi).

CAESALPINIA L.

Unarmed shrubs, glandular-punctate in part; leaves alternate, bipinnate, petiolate, the pinnae bearing several leaflets; stipules small, persistent; flowers several to many, borne in racemes, the axis of the raceme

densely glandular; calyx 5-lobed; corolla irregular; petals 5, conspicuous, the uppermost not enclosing the others in bud; stamens 10, long-exserted, brightly colored and showy, distinct; pistils sessile; pods flattened, dehiscent.

Caesalpinia gilliesii (Wallich) Dietrich. Poinciana, Bird-of-paradise. [*Poinciana gilliesii* Wallich ex Hook.; *Erythrosetmon gilliesii* (Wallich) Klotzsch]. Shrubs, commonly (1) 1.5–2.5 m tall; leaves 15–28 cm long, with 8–12 pairs of pinnae, each with 7–11 pairs of elliptic to oblong leaflets 3–8 mm long, glabrous; petioles 2–4 cm long, glabrous; racemes 10–40 cm long, terminal, the peduncle and rachis conspicuously viscid-glandular; pedicels 1.5–3 cm long; flowers very showy; sepals distinct, 15–20 mm long, stipitate glandular and puberulent; petals yellow with orange markings, 20–35 mm long; staminal filaments red, 6–9 cm long; pods ascending, sessile, oblong in outline, 55–120 mm long, 14–20 mm wide, glandular-dotted, dehiscent. Cultivated ornamental of startling beauty at low elevations in Washington Co.; Texas to California. Plantings in St. George and in Beaver Dam Wash persist and spread, finally becoming established. This is a remarkable addition to the flora of the state; 3 (ii).

CARAGANA Lam.

Shrubs; leaves alternate, even-pinnate, the rachis extended as a bristle or spine; stipules small and deciduous or persistent as spines; flowers solitary, yellow, showy; calyx campanulate or turbinate, obscurely to conspicuously 5-toothed; corolla papilionaceous; stamens 10, diadelphous; ovary sessile; pods subcylindric, linear-oblong, straight, glabrous, elastically dehiscent, the valves coiling upon dehiscence.

- 1. Leaves ovate- or cordate-acuminate; flowers 9–12 mm long; plants cultivate, introduced *C. canadensis*
- Leaves cordate-reniform or broader than long, rounded or emarginate, not acuminate apically; flowers 12–14 mm long or more *C. occidentalis*

Cercis canadensis L. American Redbud; Judas Tree. Shrub or small tree, mostly 1.5–3 m tall, rarely more; leaves commonly

Caragana arborescens Lam. Pea Tree. [*Robinia caragana* L.; *C. sibirica* Medicus; *C. inermis* Moench; *C. caragana* (L.) Karstin; *Aspalathus caragana* (L.) Kuntze]. Shrubs to 4 m tall or more; leaves 4–10 cm long; leaflets 8–12, 12–25 mm long, 5–15 mm wide, lance-oblong to elliptic or oval, cuspidate, villous above and below, becoming glabrate in age; stipules slender, occasionally persisting as spines; bracts reduced to rudiments at juncture of peduncle and pedicel; flowers 17–23 mm long, borne singly on peduncles 12–35 mm long, few to several from each bud; pedicels 5–15 mm long; calyx turbinate, pubescent, the tube 4.5–7.5 mm long, the teeth small or obsolete, the margin villous; pods ascending to declined, sessile, linear-oblong, straight 35–55 mm long, 4–7 mm thick, glabrous, the valves drying brown. Cultivated ornamental and erosion-control plant in Kane, Salt Lake, Sevier, Sanpete, Summit, and Utah cos., and probably throughout Utah (not adequately collected); introduced from central Siberia; 12 (ii). There are several other species of *Caragana* growing in North America, all introduced from the Old World. It is expected that several of these should find use in ornamental, hedge, windbreak, and erosion control plantings in the future.

CERCIS L.

Small trees or shrubs; leaves alternate, simple, palmately veined, cordate-obvate or orbicular; stipules deciduous; flowers clustered, appearing before leaves from spurs on old branches or cauliflorous, pink, showy; calyx turbinate-campanulate, shallowly 5-lobed; corolla irregular, the keel larger than the banner; stamens 10, distinct; ovary sessile; pods short-stipitate laterally flattened, the ventral suture somewhat winged, indehiscent or tardily dehiscent.

ovate-cordate, truncate to cordate basally, acuminate to acute apically, 3.5–10 cm long, longer than broad to somewhat broad-

er than long, glabrate to puberulent beneath; flowers appearing before the leaves, clustered on spurs, cauliflorous; pedicels 6–10 mm long; calyx asymmetric, 2.5–3.5 mm long, 4.3–6.3 mm wide; corolla pink (pink-purple), 9–12 mm long; keel petals 3.8–5 mm wide; pods pendulous-spreading, laterally flattened, 40–80 mm long, 8–18 mm wide, winged, the wings 0.8–2.1 mm wide, glabrous. Cultivated ornamental at 1370 to 1570 m in Salt Lake and Utah cos., and undoubtedly elsewhere; introduced from the eastern U.S., where indigenous from Nebraska south to Texas and east to the Atlantic. Our materials seem to belong to var. *canadensis*; 9 (i).

***Cercis occidentalis* Torr. ex A. Gray.** Western Redbud. Small tree or less commonly a shrub, mostly 1.5–3.5 m tall, rarely more; leaves cordate-reniform, cordate basally, rounded to emarginate apically, 2–7 cm long, commonly broader than long, glabrous or puberulent along vein axils beneath; flowers appearing before the leaves, clustered on spurs, cauliflorous; pedicels 8–12 mm long; calyx asymmetric, 3–4.5 mm long, 5.5–8 mm wide; corolla pink to pink-purple, 12–15 mm long; keel petals 5.5–8 mm wide; pods short-stipitate, 40–100 mm long, 13–20 mm wide, winged, the wings 1.5–2.5 mm wide, glabrous. Indigenous, or rarely cultivated, at 770 to 1230 m in sandstone canyons and alcoves in Garfield, Kane, Salt Lake (in cultivation), San Juan, and Washington cos.; California, Nevada, and Arizona. Variation in *Cercis* has been summarized by Isely (1975). Our material was recognized by that worker as being distinctive as a population when compared to typical California specimens. Plants from Utah, Arizona, and Nevada clearly belong to var. *orbiculata* (Greene) Tidestr. in Tidestr. & Kittell (*C. orbiculata* Greene, type from Diamond Valley, Washington Co.); 32 (v).

CLADRASTIS Raf.

Unarmed trees; leaves alternate, odd-pinnately compound, petiolate; stipules lacking; axillary buds covered by the leaf base; flowers in panicles, white, showy; calyx turbinate-campanulate, 5-toothed, sta-

mens 10, distinct or nearly so, included; ovary stipitate; pods pendulous with the panicles, oblong in outline, laterally flattened, often irregularly constricted (by abortion of the seeds), dehiscent.

***Cladrastis kentukea* (Dum.-Cour.) Rudd.** Yellow-wood. [*Sophora kentukea* Dum.-Cour.; *Virgillia lutea* Raf.; *C. lutea* (Michx.) K. Koch; *C. tinctoria* Raf.]. Tree to 10 m tall, rarely more; bark smooth; wood yellow; leaves 15–32 cm long; leaflets 7–9 (11), 4–11 cm long, 2.3–7 cm wide, elliptic to ovate or obovate, acute to obtuse basally, acuminate to acute or obtuse apically, borne on petiolules, glabrous; panicles 20–40 cm long; flowers numerous, white, 15–25 mm long; calyx 8.5–9.5 mm long, villous, the rounded lobes 1.2–1.8 mm long, densely villous; pods stipitate, the stipe 4–6 mm long, usually shorter than the calyx, the body 55–80 mm long, 8–10 mm wide, flattened, glabrous. Cultivated ornamental flowering tree of lower elevations in Cache, Salt Lake, and Utah cos., and likely elsewhere; introduced from eastern U.S. This is a beautiful tree, worthy of being cultivated more widely than at present; 3 (0).

COLUTEA L.

Unarmed shrubs; leaves alternate, odd-pinnately compound, petiolate; stipules more or less persistent, papery; flowers in racemes, yellow, showy; calyx turbinate-campanulate, 5-toothed; petals papilionaceous; stamens diadelphous, 9 and 1; ovary stipitate, the style hirsute along the ventral margin; pods pendulous, bladderly-inflated, strigulose, the incurved style persistent.

***Colutea arborescens* L.** Bladder-senna. Shrubs, 1.2–3.5 m tall, sometimes dying to the ground; herbage strigose; leaves 6–12.5 cm long; leaflets 9–13, 14–23 (30) mm long, 7.5–12.5 mm wide, obovate to oblanceolate or elliptic, rounded to emarginate, mucronate, strigose beneath, glabrous above, the veins apparent; racemes 4- to 11-flowered; pedicels 3.5–9 mm long; bracts 1.2–4.2 mm long; bracteoles 2; calyx 4.5–7.5 mm long, the tube 4.2–5.2 mm long, the teeth 1.2–2.2 mm long; flowers 16–22 mm long, yellow, the banner abruptly reflexed, the wings

strongly angled upwards, surpassed by the keel; pods stipitate, the stipe 6–10 mm long, the body bladdery-inflated, ellipsoid, 45–60 mm long (or more), 16–24 mm wide (when pressed), usually mottled, indehiscent. Bladder-senna is a cultivated shrub, mainly as an ornamental in Salt Lake and Utah cos., but recently it has been used in erosion control plantings, especially on clay soils along roadways in Juab and Sanpete cos., at elevations of 1670 to 2500 m; introduced from southern Europe and Africa; 4 (i).

CORONILLA L.

Perennial herbs, caulescent, from a taproot and caudex; leaves alternate, pinnately compound; stipules herbaceous, becoming chartaceous; flowers papilionaceous, in axillary pedunculate umbels; bracts minute, scarious; calyx 5-toothed; petals 5, pink or white, the keel long-attenuate; stamens 10, diadelphous; ovary enclosed in the staminal sheath, the style glabrous; fruit a loment, 4-angled.

Coronilla varia L. Crown Vetch. Perennial, 30–105 cm long, with spreading stems, glabrous to scabrous; stipules small; leaflets 9–23, 5–21 mm long, 1.5–11 mm wide, oblong to obovate or oblanceolate, acute to retuse apically; peduncles 3–11 cm long; bracts minute; flowers 11–20, 9–12 mm long; calyx 1.5–2 mm long, the teeth much shorter than the tube; loments 35–50 mm long. Cultivated erosion control plant, escaping and persisting, Sevier and Utah cos.; widespread in Western states; introduced from Europe; 2 (i).

CYTISUS L.

Deciduous or evergreen shrubs; leaves alternate, 3-foliolate or simple; stipules min-

ute, thickened; flowers papilionaceous, axillary, solitary or sometimes 2 or 3; bracts minute; calyx bilabiate, the upper lip 2-lobed, the lower 3-lobed; petals 5, yellow, the keel not especially alternate; stamen 10, monadelphous, with 4 longer than the other, the style curved, broadened near the concave top; pods flattened, several-seeded.

Cytisus scoparius (L.) Link. Scots Broom. Shrubs to 2 m tall or more, the branchlets green, strongly angled; leaves 3-foliolate, becoming simple upwards; flowers solitary, rarely 2 or 3, 16–22 mm long, yellow or tinged purple; pods villous along the margin. Escaped cultivated plants in Weber Co., widespread in the Pacific Coast states; introduced from Europe; 9 (0).

DALEA L.

Perennial herbs, unarmed; leaves alternate, odd-pinnate with 3 or more leaflets, glandular-dotted; stipules linear to subulate; peduncles opposite the leaves; flowers in dense spikes; calyx campanulate, 5- to 10-ribbed and 5-lobed; corolla papilionaceous, the banner petal attached near the rim of the floral cup, the other four variously inserted or all near the rim of the staminal tube; stamens 5, monadelphous; petals white, yellowish, pink, or pink-purple to indigo; pods 1- to 2-seeded, indehiscent, included in the calyx or slightly exceeding it. Note: Included herein are the herbaceous species traditionally placed in *Petalostemon*, and excluded are those shrubby species now treated as belonging to *Psoralea* (q.v.).

REFERENCES

WEMPLE, D. K. 1970. Revision of the genus *Petalostemon* (Leguminosae). Iowa State Jour. Sci. 45:1–102.

- 1. Stems prostrate; spikes slender, commonly less than 8 mm thick; leaflets 5–17; plants of Kane, San Juan, and Washington cos. *D. lanata*
- Stems decumbent to ascending or erect; spikes thicker, commonly 10 mm or more; leaflets 7 (9) or fewer; distribution various 2
- 2(1). Herbage glabrous 3
- Herbage pilose, pilosulous, or hirsute with lustrous hairs 4

- 3(2). Petals pink to pink-purple; calyx oblique, the teeth long-pilose; plants west of the Colorado River *D. searlsiae*
- Petals white (fading cream); calyx symmetric, the teeth ciliate; plants mostly east of the Colorado River (rarely to the west) *D. oligophylla*
- 4(2). Spikes dense, the longest seldom more than 5 cm long; calyx teeth 1.5–2.5 mm long; plants wide-spread in Kane, San Juan, Grand, Emery, Wayne, and Garfield cos. *D. flavescens*
- Spikes rather lax, the longest 5–14 cm long; calyx teeth 2.7–4 mm long; plants of San Juan Co. *D. epica*

***Dalea epica* Welsh.** Hole-in-the-Rock Prairie-clover. Stems ascending to erect, 20–42 cm tall, from a superficial to subterranean woody caudex, strigulose to pilose; stipules 2–4 mm long, lance-subulate to linear, persistent; leaves 1.5–3.8 cm long; leaflets 3–5, 5–19 mm long, 2–9 mm wide, flat or folded, oblanceolate to elliptic, acute, lustrous-strigulose or -pilose, glandular beneath; terminal leaflet petiolulate on a continuation of the rachis, the rachis prolongation very short; peduncles 1.5–9 (12) cm long, sparingly villous-hirsute; spikes (2) 2.5–9 (14) cm long, 12–18 mm wide (when pressed), the rachis spreading-hairy; bracts 4–7 mm long, lance-aristate, villous; calyx 5–7 mm long, obscurely 10-ribbed, the tube not translucent, the teeth 2.7–4 mm long; flowers 7.5–11 mm long, the petals white; pistils 11.5–13 mm long, the style 8.5–9.5 mm long; pods villous. Sandstone bedrock and dunes at 1530 m in San Juan Co. (west of Clay Hills Divide); endemic. The Hole-in-the-Rock prairie-clover is a near ally of *D. flavescens*, within whose range it occurs, but with whom it is apparently allopatric; 5 (v).

***Dalea flavescens* (S. Wats.) Welsh.** Kanab Prairie-clover. [*Petalostemon flavescens* S. Wats.; *Kunistera flavescens* (S. Wats.) Kuntze.]. Stems 23–52 cm tall, from a superficial caudex, glabrous to hairy (especially above); stipules 1–4 mm long, subulate, persistent; leaves 1.5–4.7 cm long; leaflets 3–7, 6–20 mm long, 1–6 mm wide, folded or flat, oblong to oblanceolate or linear, lustrous-strigulose on both surfaces, glandular beneath; terminal leaflet stalked to subsessile; peduncles 3–20 cm long, glabrous or sparsely to densely pilose-hirsute; spikes

1.5–6.5 cm long, 10–16 mm wide (when pressed), and sometimes glandular; calyx 10-ribbed, the tube not translucent, the teeth 1.5–2.5 mm long; flowers 6.2–9.5 mm long, the petals white, fading cream; pistils 7.5–10.3 mm long, the style 6–8 mm long; pods villous. Grasslands, mixed desert shrub, blackbrush, and pinyon-juniper communities, commonly in sandy soils, at 970 to 1870 m in Emery, Garfield, Grand, Kane (type from Kanab), San Juan, and Wayne cos.; Arizona, a Navajo Basin endemic. The Kanab prairie-clover is remarkably variable in several features, e.g., in number and position of glands, in vesture of the peduncle, and in width of the spike. In one specimen (Holmgren & Goddard 9990, frag. BRY) from the bottom of Glen Canyon near the mouth of Bridge (Forbidding) Canyon (now beneath Lake Powell), the calyx teeth are glandular. This seems to represent an extension of the glandular condition from bracts, where they exist or don't exist, to the calyx teeth, where they usually do not exist. Spike width varies with maturity of flowers and fruit, but there is a tendency, especially along the canyons of the Colorado River, towards very broad flowering spikes (12–16 mm), and these might warrant taxonomic recognition when more material becomes available. Plants from East Clark Bench and eastward to Last Chance Canyon in Kane Co., mainly occupy stabilized dunes dominated by *Vancleavea-Ephedra-Oryzopsis* mixtures, and have moderately to densely hairy peduncles which vary from 3–10 cm in length at anthesis. Most of the remainder of the plants in Utah have glabrous to sparingly hairy peduncles, which are 9–20 cm long at anthesis. When more specimens are

at hand, it might become prudent to treat these variants at some taxonomic level; 33 (xiv).

***Dalea lanata* Spreng.** Woolly Dalea. [*Parosella lanata* (Spreng.) Britton; *D. terminalis* (M. E. Jones) Heller]. Stems prostrate, 15–60 cm long or more, from a subterranean to superficial caudex, pilosulous to glabrous; stipules 1–2 mm long, subulate, more or less persistent; leaves 0.9–3 cm long; leaflets 5–17, 1.5–10 mm long, 1–5.5 mm wide, obovate to cuneate, truncate to emarginate, commonly folded, pilosulous or glabrous; peduncles 0.5–2.5 cm long; spikes 1.8–7.5 cm long, lax in mid- to late-anthesis and in fruit; bracts ovate-acuminate, pilosulous and with one or more large glands; calyx 3.2–4.6 mm long, the tube 2.1–2.7 mm long, glabrous, the teeth 0.9–1.9 mm long, pilosulous dorsally and ciliate; flowers 6–7 mm long, the petals indigo to rose-pink; pistils 5–6 mm long, the style 3.5–4.5 mm long; pods villous or glabrous. Stabilized dunes and other sandy sites at 970 to 1370 m in Kane, San Juan, and Washington cos.; Arizona, Colorado, and Kansas south to Mexico. Our material belongs to **var. *terminalis* (M. E. Jones) Barneby**. This variety differs from *D. lanata* var. *lanata* inter alia in the glabrous, shining, membranous calyx tube. Some plants from San Juan Co. (Harrison 12194, 12194a, 12199 BRY) are glabrous throughout, but seem not to differ otherwise; 8 (0).

***Dalea oligophylla* (Torr.) Shinn.** Western Prairie-clover. [*Petalostemon gracilis* var. *oligophyllus* Torr. in Emory; *P. gracilis* A. Gray, not *D. gracilis* Kunth; *Kuhnistera occidentalis* A. Gray ex Heller; *P. occidentale* (A. Gray) Fern.; *K. candida* var. *occidentalis* (A. Gray) Rydb.; *P. truncatus* Rydb.; *K. oligophylla* (Torr.) Heller; *P. oligophyllus* (Torr.) Rydb.; *P. truncatus* Rydb.; *P. sonora* Rydb.; *P. candidus* var. *oligophyllus* (Torr.) F. J. Hermann.; *D. candida* var. *oligophylla* (Torr.) Shinn.]. Stems decumbent to erect, 40–90 cm tall, from a superficial caudex, glabrous; stipules 1–4.5 mm long, fragile, often coiled; leaves 1.5–5.2 cm long; leaflets 4–9, 5–27 mm long, 1–7 mm wide, oblanceolate to elliptic or oblong, truncate to emarginate, com-

monly folded, glabrous, glandular beneath; peduncles 1.5–15 cm long, glabrous; spikes 1–6.8 cm long, 8–12 mm thick the rachis commonly glabrous; bracts lance-acuminate, caducous; calyx strongly 10-ribbed, usually pubescent between the ribs, the tube 2.3–3 mm long, the lobes 1–1.3 mm long; pistils 9–11 mm long, the style 8–10 mm long; pods glabrous or sparingly hairy apically. Sandy drainages and crevices in rimrock in mixed desert shrub, blackbush, pinyon-juniper, and hanging garden communities at 1070 to 1830 feet in Emery, Garfield, Grand, Kane, San Juan, and Wayne cos.; Alberta east to Saskatchewan and south to Arizona, New Mexico, Texas, Mexico, and Iowa. Utah specimens of the western prairie-clover are remarkably uniform; 35 (vi).

***Dalea searlsiae* (A. Gray) Barneby.** Searls Prairie-clover. [*Petalostemon searlsiae* A. Gray; *Kuhnistera searlsiae* (A. Gray) Kuntze]. Stems decumbent to erect, 23–65 cm tall, from a superficial caudex, glabrous; stipules 1–3 mm long, deciduous; leaves 1.4–5.2 cm long; leaflets 5–11, 3–18 mm long, 0.8–6 mm wide, oblanceolate to elliptic or almost linear, truncate to emarginate or acute, commonly involute or folded, glabrous, glandular beneath; peduncles 3.5–22 cm long, glabrous; spikes 1.6–9 (13) cm long, 8–12 mm wide, the rachis glabrous to hairy; bracts obovate to lanceolate, acuminate-aristate, deciduous; calyx 10-ribbed, the tube glabrous to moderately pilose, 2.4–2.9 mm long, the lobes 1–1.4 mm long, usually long-pilose; pistils 5–7 mm long, the style 4–5 mm long; pods villous. Sagebrush, pinyon-juniper, warm-desert shrub, or less commonly in spruce-fir communities at 1230 to 2800 m in Box Elder, Garfield, Iron, Juab, Kane, Tooele, and Washington cos.; Arizona, Nevada, and California. The Searls prairie-clover is closely allied to the ornate prairie-clover (*Petalostemon ornatum* Douglas in Hook.), whose range is contiguous to the northwest. In a broad sense, possibly *D. searlsiae* would best be included as a variety of that taxon, but its features differ in about the same order of magnitude as those used to segregate other taxa at specific levels. No attempt at com-

bination is intended or implied herein; 26 (i).

GALEGA L.

Perennial, caulescent, from a caudex and stout taproot; leaves alternate, odd-pinnate; stipules sagittate, distinct; flowers papilionaceous, borne in axillary racemes, each subtended by a bract; bracteoles 0; calyx 5-toothed; petals 5, purplish-blue, the keel subequal to the wings, attenuate apically; stamens monadelphous; ovary enclosed in the staminal sheath, the style glabrous; pods sessile, narrowly oblong in outline, more or less constricted between the seeds, unilocular.

Galega officinalis L. Goatsrue. Perennial, caulescent, 50–100 cm tall, from a branching caudex; pubescence basifixed; stems erect or ascending; stipules 7–16 mm long, sagittate, the basal lobes again once or twice lobed; leaves 3–22 cm long; leaflets 9–15, 7–52 mm long, 3–17 mm wide, lanceolate to elliptic, cuspidate-aristate apically, glabrous above, thinly pilose along veins beneath; peduncles 3–9 cm long; racemes 20- to 36-flowered, the flowers declined at anthesis, the axis 2.5–7 cm long in fruit; bracts 3.5–6 mm long, some commonly semi-sagittate; calyx 4–5.5 mm long, the tube 2–2.5 mm long, campanulate, glabrous, the teeth 2–3.2 mm long, subulate; flowers 9.5–12.5 mm long, blue-purple (fading cream); pods ascending, subcylindric, 18–38 mm long, 2–3 mm thick, longitudinally nerved, glabrous, unilocular. Introduced, established weedy plant, known in Utah only from Cache Co., where it has grown continuously since at least 1909; adventive from Europe; 4 (0).

GLEDITSIA L.

Trees, often armed with simple or branched thorns; leaves alternate, deciduous, pinnately once to twice compound (with both kinds of leaves often on the same branch, or some intermediate); stipules minute, caducous; leaflets 14–36 on once-pinnate leaves and on the 3–5 pinnae; flowers in spike-like axillary racemes, polygamous, almost regular; sepals equal or

nearly so; petals 3–5, very narrow, yellowish, the uppermost internal in bud; stamens 3–10, distinct, the anthers in pistillate flowers abortive; pods flattened, strap-like, indehiscent.

Gleditsia triacanthos L. Honey Locust. Trees to 20 m tall or more; bark smooth; leaflets 12–35 cm long, the pinnae 3–5 (8) when bipinnately compound, the leaflets 14–36 on once pinnately compound leaves and on pinnae, 10–42 mm long, 3–14 mm wide, lanceolate to oblong, crenate, obtuse to cuspidate, glabrous above, puberulent along veins beneath; racemes many-flowered, 3–7 cm long, short pedunculate or sessile; sepals separate; petals 4–5 mm long, greenish; pods sessile, oblong in outline, laterally flattened, 70–350 mm long, 15–30 mm wide, curved, indehiscent, the seeds imbedded in tissue. Cultivated shade tree, rarely escaping, in Grand, Millard, Salt Lake, Utah, and Wayne cos., and likely throughout the state at lower elevations; introduced from the eastern United States. Many horticultural forms, mainly thornless, are cultivated. The trees are handsome ornamentals, even with thorns; 15 (iii).

GLYCYRRHIZA L.

Perennial, caulescent, from stout sweet roots; leaves alternate, odd-pinnate, glandular-punctate; stipules subulate, distinct; flowers papilionaceous, in axillary racemes, each subtended by a lanceolate, deciduous bract; bracteoles 0; calyx 5-toothed; petals 5, white to cream, the keel shorter than the wings; stamens 10, diadelphous; ovary enclosed in the staminal sheath, the style glabrous; pods sessile, elliptic to oblong in outline, bur-like, armed with uncinat appendages, indehiscent, few-seeded.

Glycyrrhiza lepidota Pursh. Licorice. Plants 40–120 cm tall, from a deep-seated root; stipules 2–7 mm long, subulate; leaves 8–19 cm long; leaflets 13–19, 8–53 mm long, 3–15 mm wide, lanceolate to oblong, mucronate, glabrous above, glandular-dotted and puberulent beneath; peduncles often paired, 3–8 cm long; racemes 20- to 50-flowered, the flowers ascending at anthesis, the rachis, 2.5–9 cm long in fruit; bracts 5–8 mm long, caducous; calyx 4.8–6.9 mm

long, the tube 2.5–4.9 mm long, campanulate to short-cylindric, stipitate-glandular, the teeth 1.5–3.6 mm long; flowers 9.1–13 mm long, white to cream; pods spreading, laterally compressed, oblong, 13–20 mm long, the body 5–7 mm wide, beset with hooked prickles, simulating cocklebur. Terraces, streamsides, seeps, and other semi-moist sites in streamside, greasewood, mixed desert shrub, and pinyon-juniper communities at 670 to 2470 m in Beaver, Cache, Daggett, Garfield, Grand, Kane, Millard, Piute, Rich, Salt Lake, San Juan, Sevier, Summit, Uintah, Washington, Wayne, and Weber cos.; widespread in the United States, except for the southeast; 53 (xii).

GYMNOCLADUS L.

Unarmed trees; leaves alternate, deciduous, bipinnately compound; stipules small, deciduous; leaflets 9–15 on each of the 3–7 pinnae, or the lowermost pinnae represented by leaflets; flowers in terminal panicles, dioecious or polygamous, regular or nearly so; calyx 5-lobed; petals 5, distinct; pods broad-oblong, hard, thick, flattened, pulpy.

Gymnocladus dioica (L.) K. Koch. Kentucky Coffee-tree. [*Guilandina dioica* L.; *Gymnocladus canadensis* Lam.]. Tree to 20 m or more; leaves 20–60 (90) cm long; pinnae 3–7 pair, each with 9–15 leaflets, these 17–70 mm long, 7–30 mm wide, ovate to lanceolate, entire, acuminate, pilose (especially along the veins) beneath, glabrous to glabrate above; panicles many-flowered; pistillate panicles to 25 cm long, the staminate

much smaller and more dense; flowers 10–13 mm long, greenish white; fruit 100 to 200 mm long; 30–50 mm wide, persistent, tardily dehiscent, the large seeds imbedded in tissue. Cultivated ornamental and botanical curiosity in Salt Lake and Utah cos., and probably elsewhere; introduced from the eastern United States. The Kentucky coffee-tree is so named because the pulp surrounding the seeds is rich in a polysaccharide which, when roasted, has been used as a coffee substitute; 4 (i).

HEDYSARUM L.

Perennial herbs, caulescent, from a caudex and taproot; leaves alternate, odd-pinnate, stipules adnate to the petiole base, at least the lowermost connate-sheathing; flowers papilionaceous, in axillary racemes, each subtended by a bract; bracteoles 2; calyx 5-toothed; petals 5, red-purple to pink or pink-purple, the keel much longer than the wings, abruptly bow-shaped; stamens 10, diadelphous; ovary enclosed in the staminal sheath, the style glabrous; loments with 2–8 segments, prominently reticulate.

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1. Leaflets thin, the veins readily apparent; fruit segments winged; calyx lobes unequal, shorter than the tube; plants rare in eastern Utah *H. occidentale*
- Leaflets thick the veins not apparent; fruit segments not winged; calyx lobes subequal, longer than the tube; plants common, widespread *H. boreale*

Hedysarum boreale Nutt. Northern Sweetvetch. Perennial, caulescent, 17–70 cm tall, from branching subterranean to superficial caudex; pubescence basifixed; stems decumbent to erect; stipules 2–10 mm long, at least some connate-sheathing; leaves 3–12

cm long; leaflets 5–15, 7–35 mm long, 2–19 mm wide, oblong to elliptic, lance-oblong, or ovate (rarely linear), strigose on both sides or glabrate to glabrous above; peduncles 2.8–15 cm long; racemes 5- to 45-flowered, the flowers ascending at anthesis,

the axis 5–28.5 cm long in fruit; bracts 2–5 mm long; pedicels 0.8–4.5 mm long; bracteoles 2; calyx 4.5–8 mm long, the tube 2.5–3.5 mm long, campanulate, strigose, the teeth 2–6 mm long, subulate; flowers 10–19 mm long, red-purple to pink or pink-purple,

less commonly white; loment stipitate, pendulous to spreading, with 2–8 segments, not winged, prominently reticulate. Our material belongs to ssp. *boreale* and is separable into two varieties.

- 1. Segments of the loment bearing spines on the lateral surfaces; plants of Uintah Co. *H. boreale* var. *gremiale*
- Segments of the loment lacking spines; plants widespread *H. boreale* var. *boreale*

Var. *boreale*. [*H. camulosum* Greene; *H. pabulare* A. Nels; *H. utahense* Rydb.; *H. pabulare* var. *rivulare* L. O. Williams; *H. mackenziei* var. *pabulare* (A. Nels.) Kearney & Peebles; *H. utahense* Rydb., type from Salt Lake City; *H. boreale* var. *utahense* (Rydb.) Rollins; *H. canescens* Nutt. ex Torr. & Gray; *H. cinerascens* Rydb.; *H. mackenziei* var. *canescens* (Nutt.) Fedtsch.; *H. boreale* var. *cinerascens* (Rydb.) Rollins; *H. boreale* var. *obovatum* Rollins]. Mixed desert shrub, pinyon-juniper, mountain brush, ponderosa pine, and aspen communities at 1175–2500 m in Box Elder, Cache, Carbon, Davis, Duchesne, Emery, Garfield, Grand, Juab, Millard, Salt Lake, San Juan, Sanpete, Sevier, Tooele, Uintah, Utah, Wasatch, Washington, Wayne, and Weber cos.; Alberta east to Manitoba and south to Nevada, Arizona, New Mexico, and Texas. The use of leaf pubescence, or lack thereof, to segregate the var. *boreale* into further taxa is a function in frustration, leading to two essentially sympatric phases which might reflect ecology more than genetics; 142 (xxiv).

Var. *gremiale* (Rollins) Northstrom & Welsh. [*H. gremiale* Rollins]. Pinyon-juniper and mountain brush communities at 1470 to 1670 m in Uintah Co.; endemic. The spines on the loment segments vary from few (or none) to numerous, indicating complete transition with var. *boreale*. Incipient spines are found in specimens of var. *boreale* from outside of Utah, but nowhere are the spines so well or so consistently developed as in Uintah Co.; 3 (0).

***Hedysarum occidentale* Greene.** Western Sweetvetch. [*H. lancifolium* Rydb.; *H. marginatum* Greene; *H. uintahense* A. Nels.]. Perennial, caulescent, 30–90 cm tall, from a

branching, superficial caudex; pubescence basifixed; stems ascending to erect; stipules 10–17 mm long, at least some connate-sheathing; leaves 8–20 cm long; leaflets 11–19, 9–37 mm long, 4–16 mm wide, ovate to lance-ovate or elliptic, apiculate to emarginate, strigose on both sides or glabrous above; peduncles 3.7–15 cm long; racemes 10- to 50-flowered, the flowers spreading to declined at anthesis, the axis 6–14 cm long in fruit; bracts 2–8 mm long; bracteoles 2; calyx 3.5–11 mm long, the tube 2.3–6 mm long, campanulate, glabrous to strigose, the teeth 0.5–2 mm long, triangular; flowers 16–23 mm long, pink to red-purple; loment stipitate, pendulous, with 1–5 segments, winged. Mountain brush, sagebrush, and lower spruce-fir-aspen communities at 1770 to 2430 m in Carbon, Duchesne, Emery, and Summit cos.; British Columbia south of Washington, Montana, Idaho, Wyoming, and Colorado. Utah plants have been collected in flower and fruit in mid-to late summer; 8 (vi). Material from Carbon and Emery counties differs from the main body of the species in leaflet features and is separable as var. *canone* Welsh var. nov. *Hedysaro occidentali* var. *occidentali* aemulans sed foliolis ovatis ellipticis vel late lanceolatis et apice retusis truncatis vel apiculatis. Holotype: Utah; Carbon Co. 14 mi due ENE of Helper, Soldier Creek, 7408 feet, Welsh & Taylor 15256, 30 June 1977 (BRY). Paratypes: Carbon Co., Soldier Canyon, Welsh & Christensen 6614, 11 August 1967; 2.5 mi due N. of Sunnyside, Welsh & Taylor 15075, 21 June 1977; east of Sunnyside, Welsh & Murdock 9146, 19 July 1969, do, Welsh & Christensen 6598, 11 Aug 1967. Emery Co., 9 mi due NNE of Wood-

side, Welsh 14923, 9 June 1977 (all BRY).

HOFFMANSEGGIA Cavanilles

Perennial herbs, rhizomatous (?) and with a subterranean caudex; leaves alternate, bipinnately compound, odd-pinnate as to pinnae and even-pinnate as to leaflets, the leaflets not glandular punctate; stipules distinct, persistent; flowers in terminal racemes, perfect, irregular; calyx 5-lobed; petals 5, yellow, the uppermost internal in bud; stamens 10, the filaments distinct; pods oblong or falcate in outline, laterally compressed, indehiscent.

Hoffmanseggia repens (Eastwood) Cockerell. Creeping Rush-pea. [*Caesalpinia repens* Eastwood; *Moparia repens* (Eastwood) Britton]. Subcaulescent or shortly caulescent, 5–12.5 cm tall (above ground), from a deeply subterranean caudex, the branches below ground 3–15 cm long, pale; pubescence basifixed; leaves 2.5–9.5 cm long; pinnae 3–7 (9); leaflets 4–14, 3–12 mm long, 1–6 mm wide, asymmetrically obovate-elliptic to oblong, crowded, entire, villosulous; peduncles 1.2–6 cm long; racemes 7- to 26-flowered, the flowers spreading at anthesis, the axis 3–8 cm long in fruit; bracts 3–7 mm long, caducous; bracteoles 0; pedicels 2–7 mm long; calyx 8–10.5 mm long, the tube 2–4.5 mm long, campanulate, retrorsely villosulous, the teeth 6–8.5 mm long, oblong-lanceolate, villosulous; flowers opening flat or nearly so, the petals yellow, 10–12 mm long, red-spotted near the base, the whole fading pink-orange; pods pendulous, oblong, 20–50 mm long, 10–20 mm wide, membranous, pilosulous. Sandy deserts with *Ephedra*, *Oryzopsis*, and other arenophilus plants at 1430 to 1670 m in Emery, Garfield, Grand (type from Court House Wash), and Wayne cos.; endemic. This is a striking plant in the light of early morning along the sandy stretches near Hanksville; 20 (iv).

LABURNUM Medic.

Trees, unarmed; leaves alternate, palmately trifoliolate; stipules lacking; flowers in terminal, pendulous racemes, perfect; calyx 2-lipped, the upper lip 2-toothed, the lower lip with 3 coalescent teeth; petals all

distinct; stamens 10, monadelphous; ovary stipitate; pods pendulous with the raceme, narrowly oblong, laterally compressed, more or less constricted between the few to several seeds.

Laburnum anagyroides Medic. Golden-chain, Bean-tree. [*L. vulgare* Bercht. & Presl.; *Cytissus laburnum* L.]. Slender trees to 6 m tall; leaves (including petioles) 1.7 cm long 2.5–15 cm long; leaflets 3, palmate, 1.4–7.5 cm long, 0.7–3.5 cm wide, lanceolate to elliptic or oblanceolate, acute to obtuse or rounded, strigulose to glabrate beneath, glabrous above, often ciliate; peduncles 1.2–3.8 cm long; racemes (7) 15- to 50-flowered, the flowers inverted and spreading at anthesis, the axis 15–30 cm long in fruit; bracts lacking; bracteoles 0; pedicels 8–14 mm long; calyx oblique, 4.5–5.5 mm long, the tube 3–4 mm long, glabrous, the lobes about 1.5 mm long, tufted hairy; flowers 14–17 mm long, yellow; pods stipitate, the stipe 2–5 mm long, the body oblong in outline, 30–50 mm long, 5–8 mm wide, strigose, tardily dehiscent. Cultivated ornamental trees of great beauty, in population centers, in much of Utah; introduced from southern Europe; 4 (0).

LATHYRUS L.

Annual or perennial herbs, clambering, trailing, or climbing; leaves alternate, even-pinnately compound, the rachis terminating in a bristle or prehensile tendril; stipules herbaceous, semi-hastate or semi-sagittate; leaflets 2–12, very variable; flowers in axillary racemes, papilionaceous; calyx 5-toothed, obliquely campanulate; petals 5, white or cream to pink, purplish, or otherwise (in cultivated types), the wings not adnate to the keel, but fitted together in a groove; stamens 10, diadelphous; style laterally compressed, bearded along the ventral (upper) edge; pods oblong, several-seeded, the valves coiling upon dehiscence.

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Welsh stat. nov. based on *Lathyrus eu-cosmus* Butters & St. John Rhodora 19:160. 1917. [*L. brachycalyx* ssp. *eu-cosmus* (Butters & St. John) Welsh.] Clay soil in washes in salt desert shrub communities at 1450 to 1700 m in Emery, Grand, and Sanpete cos.; Colorado, New Mexico, and Arizona; 5 (0).

Var. *zionis* (C. L. Hitchc.) Welsh stat. nov. based on *Lathyrus zionis* C. L. Hitchc., Univ. Wash. Publ. Biol. 15:36. 1952. [*L. brachycalyx* ssp. *zionis* (C. L. Hitchc.) Welsh.] Sandy soils in pinyon-juniper, mixed desert shrub, and riparian communities at 1200 to 2500 m in Garfield, Grand, Kane, San Juan, and Washington cos.; Arizona; 42 (vi).

***Lathyrus lanzwertii* Kellogg.** Lanzwert Sweetpea. Plants clambering, decumbent to erect, 20–60 cm tall, the herbage glabrous

to villous; stipules 7–20 mm long, semi-sagittate; leaves 2–14 cm long (excluding tendrils) leaflets 4–12, 7–75 mm long, 3–18 (26) mm wide, elliptic to lanceolate, oblanceolate, or oval; tendrils short and simple to more commonly branched and prehensile; peduncles 2–8.5 cm long; racemes 2- to 5-flowered, the flowers spreading at anthesis; calyx tube 3.5–6 mm long, campanulate, the lower lateral teeth 1.8–4.2 mm long, triangular to lanceolate; flowers 12–22 mm long, pink-purple to white or cream and commonly suffused or veined with pink or purple; pods 30–60 mm long, 3–7 mm wide. Three rather poorly defined and apparently intergrading varieties are present in Utah. The following arbitrary key will allow segregation of most of the specimens.

- 1. Tendrils reduced to a simple filiform stalk, rarely coiled; leaflets commonly 6 only; plants rare in southern Utah *L. lanzwertii* var. *arizonicus*
- Tendrils commonly branched and/or coiled; leaflets often more than 6; plants widespread 2
- 2(1). Flowers white, less commonly suffused or veined with pink or purple, mostly 15–22 mm long; plants more abundant southward in Utah *L. lanzwertii* var. *laetivirens*
- Flowers pink-purple or suffused with purple, commonly 12–17 mm long; plants more abundant northward in Utah *L. lanzwertii* var. *lanzwertii*

Var. *arizonicus* (Britton) Welsh. comb. nov. based on *L. arizonicus* Britton Trans. N. Y. Aca. Sci. 8:65. 1899. Aspen and mountain brush communities at 2470 to 2770 m in San Juan Co.; Arizona; 4 (0).

Var. *laetivirens* (Green) Welsh stat. nov. based on *Lathyrus laetivirens* Greene ex Rydb. Fl. Colorado 2.7. 1906. [*L. leucanthus* Rydb.; *L. leucanthus* var. *laetivirens* (Greene) C. L. Hitchc.] Riparian, aspen, mountain brush, coniferous woods, and other montane communities, at 1830 to 3130 m in Beaver, Carbon, Emery, Garfield, Grand, Millard, Salt Lake, San Juan, Sanpete, Sevier, and Washington cos.; Colorado. 32 (x).

Var. *lanzwertii*. [*L. coriaceus* White, type from Wasatch Mts.]. Aspen, Douglas fir, spruce fir, and less commonly in mountain brush communities at 1650 to 2400 m in Davis, Duchesne, Garfield, Rich, Tooele, Salt Lake, Sanpete, Sevier, Summit, Utah,

and Wasatch cos.; Washington, Oregon, California, Idaho, and Nevada; 54 (xxii).

***Lathyrus latifolius* L.** Perennial Sweetpea. Perennial, climbing vines, 80–200 cm tall, the stems broadly winged, glabrous; stipules 9–40 mm long, semi-hastate to semi-sagittate; leaves 6–12 cm long (excluding tendrils) leaflets 2, 35–80 (150) mm long, 5–23 (50) mm wide, lance-elliptic to oblong or ovate; tendrils branched, coiled; peduncles 7–15 cm long; racemes 5- to 15-flowered, the flowers spreading at anthesis; calyx tube 5.8–6.2 mm long, campanulate, the lower lateral calyx teeth 3–6 mm long, lanceolate; flowers 20–25 mm long, pink-purple, pink or white; pods 60–80 mm long, 7–10 mm wide, glabrous. Cultivated, escaping and now established, mainly along canal banks in Carbon, Grand, and Utah cos., and probably widespread; introduced from Europe; 4 (ii).

***Lathyrus odoratus* L.** Sweetpea. Annual,

climbing vines, 80–300 cm tall, the stems broadly winged, pubescent; stipules 10–30 mm long, semi-hastate; leaves 6–15 cm long (excluding tendrils); leaflets 2, 25–85 mm long, 8–40 wide, elliptic to ovate or oblanceolate; tendrils well-developed, prehensile; peduncles 3–28 cm long; racemes 2- to 5-flowered, the flowers spreading at anthesis; calyx tubes 5.5–7.5 mm long, campanulate, spreading-hairy, the lower lateral teeth 5–8 mm long, lanceolate; flowers 25–37 mm long, varicored; pods 30–60 mm long, 5–8 mm wide, pubescent. Cultivated ornamental or greenhouse and outside plantings, growing best in cool middle elevations of the state; introduced from Europe; 2 (ii).

Lathyrus pauciflorus Fern. Utah Sweetpea. [*L. utahensis* M. E. Jones; *L. pauciflorus* var. *utahensis* (M. E. Jones) Peck; *L. bradfieldianus* A. Nels.]. Perennial, 20–100 cm tall or more, climbing vines, glabrous; stems merely angled; stipules 8–32 mm long, the larger ones, at least, foliose and toothed; leaves 2–12.5 cm long (excluding tendrils); leaflets 8–12, 14–50 mm long, 8–32 mm wide, ovate to elliptic; tendrils well-developed, prehensile; peduncles 3.5–24 cm long; racemes 3- to 10-flowered, the flowers spreading at anthesis; calyx tube 5–7.3 mm long, obliquely campanulate, more or less gibbous, the lower lateral teeth 2.5–7 mm long, often curved and spreading; flowers (13) 15–23 (27) mm long, pink to pink-purple, with keel usually pale or white; pods 40–75 mm long, 7–11 mm wide. Oak-sagebrush, mountain brush, aspen, lodgepole pine, mixed conifer, and meadow communities at 1370 to 2900 m in Box Elder, Cache, Davis, Millard, Salt Lake, Sanpete, Sevier, Summit, Tooele, Utah, Wasatch, and Weber cos.; Washington, Oregon, Idaho, Colorado, and Arizona. The Utah sweetpea forms apparent hybrids with *L. lanzwertii*. Leaf and flower features are intermediate in such plants (e.g., Higgins 1048; Clark 2008; Welsh & Isely 6378, all BRY); 71 (x).

Lathyrus sylvestris L. Scots Sweetpea. Perennial, 60–200 cm tall, clambering, the stems broadly winged, glabrous; stipules 20–34 mm long, semi-sagittate; leaves 3–12 (15) cm long (excluding tendrils); leaflets 2,

30–120 mm long, 5–40 mm wide, linear-lanceolate to lanceolate or elliptic; peduncles 8–22 cm long; racemes 4- to 9-flowered, the flowers ascending-spreading at anthesis; calyx tube 4–5 mm long, campanulate, the lower lateral teeth 1.7–4 mm long, lanceolate; flowers 15–18 mm long, red or red-purple; pods 40–60 mm long, 5–8 mm wide, glabrous. Cultivated ornamental, persisting, escaping, and established in Utah Co., and probably elsewhere; introduced from Europe. 2 (0).

LESPEDEZA Michx.

Perennial herbs (or woody at the base), from a caudex; leaves alternate, pinnately trifoliolate; stipules inconspicuous; flowers papilionaceous, in axillary racemes or subpaniculate, each subtended by a bract; bracteoles 2, attached at base of calyx; calyx 5-toothed; petals 5, pink-purple; stamens 10, diadelphous; ovary 1-ovuled, the style incurved and beardless, the stigma small and terminal; pod short, partially included in the calyx.

Lespedeza thunbergii (DC.) Nakai. Thunbery Bush Clover. [*Desmodium thunbergii* DC.]. Perennial, 80–100 cm tall or more and 150–200 cm wide, clump-forming; pubescence basifixed; stems striate; petioles 0.3–0.8 cm long; leaflets 3, lacking stipules, commonly 20–50 mm long, elliptic to oblong, glabrous above, strigose beneath; peduncles 0.5–1.2 cm long; racemes many-flowered; flowers 10–12 mm long (or more?), pink-purple; bracteoles lanceolate; pods obovate to oblong, to 10 mm long. Cultivated ornamental plant in Utah Co.; introduced from China.

LOTUS L.

Plants annual or perennial herbs or suffrutescent, caulescent, from a taproot and caudex; leaves alternate, pinnately (or appearing palmately) compound; stipules foliaceous, scarious, or gland-like; flowers papilionaceous, in axillary pedunculate umbels or solitary; bracts leaf-like; calyx 5-toothed; petals 5, yellow or white, sometimes suffused with red, the keel long-attenuate; sta-

mens 10, diadelphous; ovary enclosed in the staminal sheath, the style glabrous; pods flattened or subterete, straight, one to several-seeded, dehiscent.

REFERENCE

OTTLEY, A. M. 1944. The American *Loti* with special consideration of a proposed new section, *Simpetertia*. *Brittonia* 5:81-123.

1. Plants annual, prostrate to ascending; flowers sessile in leaf axils; plants of Washington Co. 2

— Plants perennial, sometimes flowering the first year, prostrate to erect 3

2(1). Plants subglabrous or merely strigose; calyx teeth subequal to the tube; pods 10-15 mm long *L. subpinnatus*

— Plants villous; calyx teeth much longer than the tube; pods 5-10 mm long
..... *L. humistratus*

3(1). Flowers sessile, solitary in leaf axils, or on peduncles to 2.6 cm long; plants indigenous in San Juan Co. *L. wrightii*

— Flowers pedunculate, solitary or 2 to several; plants variously distributed, not or seldom of San Juan Co. 4

4(3). Plants suffruticose, rigid, commonly erect, internodes greatly exceeding leaf length; bracts of inflorescence 1 or 0; plants of Washington Co. *L. rigidus*

— Plants herbaceous, prostrate to ascending or erect; internode and leaf length various; bracts of inflorescence 1 or more; distribution various 5

5(4). Stipules leaflet-like; plants introduced, cultivated and escaping 6

— Stipules reduced to glands; plants indigenous 7

6(5). Flowers 3 or 4, 7-9; leaflets of main leaves lance-linear to narrowly elliptic, acute *L. tenuis*

— Flowers 5-12, 8-12 mm long; leaflets of main leaves obovate, rounded
..... *L. corniculatus*

7(5). Leaves sessile, the leaflets strictly palmate, usually drying a lead-green color; plants widely distributed in central to southwestern Utah *L. utahensis*

— Leaves short-petiolate, the rachis elongate and at least one leaflet pinnately disposed; plants of western Kane, Washington, and Iron cos. *L. longibracteatus*

***Lotus corniculatus* L.** Bird's-foot Trefoil. Perennial, 10-50 cm long, with ascending or procumbent stems, glabrous or strigose; stipules foliar, almost or quite as large as the leaflets; leaflets 3, 5-15 mm long, 2-8 mm wide, obovate, rounded apically; peduncles 0.5-7.5 cm long; bracts 1- to 3-foliate; flowers (1 or 2) mostly 5-12, 8-12 mm long, yellow; calyx 3-4 mm long, the teeth subequal to the tube; pods linear 20-35 mm long, 2-3.5 mm thick, subterete, straight, glabrous. Cultivated forage plant of moist pastures, persisting in Cache, Millard, Utah, and Washington cos., and to be ex-

pected elsewhere; introduced from Europe; 2 (0).

***Lotus humistratus* Greene.** Low Trefoil. Annual, 6-30 cm long, with prostrate to ascending stems; stipules reduced to glands; leaves pinnate, the rachis flattened; leaflets 3-5, 3-15 mm long, 1-8 mm wide, obovate to oblanceolate, obtuse apically; peduncles 0, the flowers solitary, axillary, 4-6 mm long, yellow or tinged red; calyx 3-4 mm long, the teeth much longer than the tube; pods 5-10 mm long, 2.5-3.5 mm wide, laterally compressed, strigulose-villous. Sandy or gravelly sites in creosote bush and warm

desert shrub communities at 670 to 800 m in Washington Co.; Arizona, New Mexico, and California; Mexico; 4 (0).

Lotus longebracteatus Rydb. Long-bracted Trefoil. [*Anisolotus longebracteatus* (Rydb.) Rydb.; *Hosackia rigida* var. *numularia* M. E. Jones; *Anisolotus numularius* (M. E. Jones) Woot. & Standl.; *L. numularius* (M. E. Jones) Tidestr., not Reichb. ex Steud.; *L. numulus* Drayton; *L. rigidus* x *utahensis* Ottley]. Perennial, 7–38 cm long, with prostrate to decumbent stems radiating from a herbaceous, superficial caudex; stipules reduced to glands; leaves petiolate, pinnate, with at least one leaf commonly placed along the short rachis; leaflets 3 or 4, 2–22 mm long, 1–8 mm wide, oblanceolate to elliptic or oval (on lowermost leaves), obtuse to acute; peduncles 0.5–6.5 cm long; bracts 1- to 3-foliate; flowers 1 or 2, 12–17 mm long, yellow, suffused with red; calyx 5–8 mm long, the tube 2.8–5.1 mm long, strigose, the teeth 2.2–3.9 mm long, shorter than the tube; pods narrowly oblong, 15–28 mm long, 3–4 mm wide, straight, strigose. Sandy and gravelly sites in desert shrub, riparian, and pinyon-juniper communities at 670 to 1600 m in Iron, Kane (west of the Paria River), and Washington cos.; Nevada and Arizona. Plants of long-bracted trefoil were considered by Ottley (1944: 109–113) to be hybrids between *L. rigidus* and *L. utahensis*. Specimens from Utah, even those annotated by Ottley, do not support that interpretation. They are not intermediate between the putative parents. Rather, the plants have features not shared by either *L. utahensis* or *L. rigidus*. Both of these taxa have erect or ascending stems from ligneous to subligneous superficial to subterranean caudices. The stems of *L. longebracteatus* are prostrate-decumbent or procumbent from a herbaceous caudex, a feature evidently overlooked by Ottley, and not shared by either of the purported parents. Other more subtle characteristics differ also (see descriptions); 42 (vi).

Lotus rigidus (Benth.) Greene. Bush Trefoil. [*Hosackia rigida* Benth.; *Anisolotus rigidus* Rydb.; *L. argensis* Coville]. Perennial, 25–70 cm tall, with erect or ascending stems commonly woody at the base, from a

ligneous or subligneous, superficial caudex; stipules reduced to glands; leaves petiolate, the rachis flattened, pinnate, with at least one leaflet along the rachis; leaflets 3–5, 2–20 mm long, 0.8–4 mm wide, oblanceolate to oblong, obtuse to emarginate; peduncles 2.3–14 cm long; bracts 1- to 3-foliate; flowers 1–3, 12–23 mm long, yellow suffused with red; calyx 6.2–10 mm long, the tube 4.2–6.5 mm long, cylindro-campanulate, strigose, the teeth 2–4 mm long, shorter than the tube; pods narrowly oblong, 32–45 mm long, 3.7–4.2 mm wide, straight, glabrous. Sandstone outcrops and sandy to clay banks and terraces at 800 to 1070 m in Washington Co.; Nevada, Arizona, California, and Mexico. The bush trefoil is a remarkable plant, forming rounded clumps of very brittle stems, making difficult the task of representing it well on herbarium mounts; 11 (iii).

Lotus subpinnatus Lag. Mohave Trefoil. [*Hosackia subpinnata* (Lag.) Torr. & Gray; *L. wrangelianus* Fischer & Meyer]. Annual, 3–30 cm long, with prostrate to ascending stems, glabrous to strigose; stipules reduced to glands; leaves pinnate, the rachis flattened; leaflets 3–5, 1.5–15 mm long, 0.8–7 (10) mm wide, obovate, obtuse to truncate apically; peduncles 0, the flowers solitary, axillary, 4.5–7 mm long, yellow or suffused red; calyx 2.8–5 mm long, the teeth subequal to the tube; pods 10–15 mm long, 2.8–3.1 mm wide, compressed, sparingly strigose. Salt desert shrub and warm desert shrub communities at 870 to 1100 m in Washington Co.; Nevada and California; 4 (0).

Lotus tenuis Kit. in Willd. Slender Trefoil. [*L. corniculatus* β *tenuifolius* L.; *L. tenuifolius* (L.) Reichb.]. Perennial, 20–60 cm long, with weak, ascending stems, glabrous; stipules foliar, almost or quite as large as the leaflets; leaflets 3, 5–15 mm long, 2–4 mm wide, lanceolate to narrowly oblanceolate or lance-linear, acute apically; peduncles 2–7.5 cm long; bracts 1- to 3-foliate; flowers 2–4, 7–9 mm long, yellow (often drying blue); calyx 4–5 mm long, the teeth subequal to the tube; pods linear, 25–30 mm long, 2–3 mm thick, subterete, straight, glabrous. Cultivated forage plant of

moist meadows, persisting in Utah Co., and probably elsewhere; introduced from Europe; 1 (0).

***Lotus utahensis* Ottley.** Utah Trefoil. Perennial, 15–43 cm tall, with erect-ascending stems from a shallowly subterranean, subligneous caudex; stipules reduced to glands; leaves sessile, palmate; leaflets 3–5, 2–23 mm long, 1.5–7 mm wide, spatulate to oblanceolate or oblong, obtuse to acute; peduncles 1.4–7.5 cm long; bracts 1- to 3-foliate; flowers 1–5, 12–16 mm long, yellow, suffused with red; calyx 4.5–8.7 mm long, the tube 3.3–4.5 mm long, shorter than the tube; pods narrowly oblong, 22–35 mm long, 2.5–3.5 mm wide, minutely strigulose to glabrate, shining, straight. Sagebrush, pinyon-juniper, mountain brush, aspen, and spruce-fir communities at 1470 to 2730 m in Beaver, Garfield, Iron, Kane, Millard, Piute, Sevier, Utah, Washington, and Wayne cos.; Nevada and Arizona; 79 (xvi).

***Lotus wrightii* (A. Gray) Greene.** Wright Trefoil. [*Hosackia wrightii* A. Gray; *Anisolotus wrightii* (A. Gray) Rydb.]. Perennial, 12–60 cm tall, with erect-ascending stems from a commonly superficial caudex; stipules reduced to glands; leaves petiolate (sometimes shortly so), palmate; leaflets 3–5, 3–22 mm long, 1–5 mm wide, spatulate to oblanceolate, oblong, linear, obtuse to acute; peduncles 0–2.6 cm long; bracts 1-to 5-foliate; flowers commonly solitary, rarely 2, 14–18 mm long, yellow, suffused with red; calyx 7.5–9.2 mm long, longer than or subequal to the tube; pods narrowly oblong, 25–34 mm long, 2–2.6 mm wide, strigulose to villosulous, straight. Ponderosa pine woods at 1830 to 2130 m in San Juan Co.; Colorado, Arizona, and New Mexico; 4 (0).

LUPINUS L.

Plants annual or perennial herbs; leaves alternate, palmately compound; stipules slender, persistent; flowers borne in terminal racemes, perfect; calyx bilabiate, the lips entire or toothed, commonly with brac-

teoles; petals usually blue or blue-purple, less commonly whitish, yellowish, or reddish, the banner variously reflexed, glabrous or variously hairy dorsally, the wings mostly glabrous, the keel glabrous or ciliate on upper (less commonly on lower) edges; stamens 10, monadelphous, with 5 long filaments alternating with 5 short ones; pods laterally compressed, 2- to several-seeded. *Note:* The genus is notoriously difficult because of lack of clear diagnostic features. Taxa tend to grade morphologically into each other, probably due to hybridization. Wide ranging taxa tend to intergrade with all other taxa which they contact. Because of these problems, and because of the likelihood of cleistogamy in some taxa, some specimens can be assigned to described entities only arbitrarily. The following key represents an attempt to provide meaningful determination of most of the materials from Utah. It is tentative at best.

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1. Plants annual, the cotyledons commonly persistent Key I
- Plants perennial, the cotyledons not present at flowering Key II

KEY I. PLANTS ANNUAL

- 1. Leaflets long-pilose on both surfaces; cotyledons petiolate; ovules 4-6; plants of Washington Co. *L. concinnus*
- Leaflets variously hairy beneath, glabrous or glabrate above; cotyledons sessile; ovules 2-6; plants of various distribution 2
- 2(1). Flowers borne in subcapitate racemes, the rachis commonly 2 cm long or shorter 3
- Flowers borne in elongate racemes, the rachis commonly 2 cm long or longer 4
- 3(2). Plants subacaulescent or acaulescent, the internodes seldom to 1 cm long; upper calyx lip 2 mm long or less, entire *L. brevicaulis*
- Plants caulescent, with several developed internodes, at least some more than 2 cm long; upper calyx lip 3-6 mm long, bilobed *L. kingii*
- 4(2). Plants caulescent; keel petals ciliate, at least on lower margin near the base; ovules 4-6; plants of Washington Co. *L. sparsiflorus*
- Plants acaulescent, subacaulescent, or short caulescent; keel petals ciliate on upper edges towards the apex; ovules 2; plants of various distribution 5
- 5(4). Peduncles 1.5-7.5 cm long; pods not constricted between the seeds; plants subacaulescent to short caulescent, known from Washington Co. *L. flavoculatus*
- Peduncles 0-3.5 cm long; pods constricted between the seeds; plants mostly short caulescent, widespread in Utah *L. pusillus*

KEY II. PLANTS PERENNIAL

- 1. Leaflets glabrous above 2
- Leaflets pubescent above 6
- 2(1). Banner reflexed at or below the midpoint, glabrous or pubescent distally along the crest; plants of Washington Co. *L. laxiflorus*
- Banner reflexed above (beyond) the midpoint, hairy if at all beneath the upper calyx lip, or as if as above then not of Washington Co. 3
- 3(2). Leaves mainly basal, the petioles 8-13 cm long or more, coarsely hirsute; stems from a rhizome; plants of San Juan Co. *L. ammophilus*
- Leaves mainly well distributed along the stem, the petioles commonly less than 8 cm long, stri-gose or silvery hairy; stems from a caudex; plants of various distribution 4
- 4(3). Flowers 5-7 mm long; keel densely ciliate; plants of Salt Lake, Summit, and San Juan cos. *L. argenteus*
- Flowers 8-12 mm long; keel thinly ciliate, or the margin glabrous 5
- 5(4). Leaflets abruptly obtuse to rounded; racemes more than 15 cm long *L. argenteus*
- Leaflets obtuse to acute (rarely rounded); racemes mostly less than 15 cm long *L. maculatus*
- 6(1). Banner glabrous dorsally 7
- Banner pubescent on the back (look beneath upper lip of calyx) 11

- 7(6). Flowers 10–13.5 mm long; calyx saccate-gibbous or shortly spurred; leaves mainly basal; plants of Uintah and Kane cos. *L. wyethii*
- Flowers 7–13 mm long; calyx not especially gibbous; leaves distributed along the stem, or all leaves basal; plants of various distribution 8
- 8(7). Plants acaulescent or short-caulescent; leaves essentially all basal 9
- Plants caulescent; leaves distributed along the stem 10
- 9(8). Plants low, 3–12 cm tall; racemes sessile, surpassed by the foliage; distribution montane *L. caespitosus*
- Plants 15–40 cm tall; racemes shortly pedunculate, much surpassing the foliage; distributed in western Iron and Washington cos. *L. volutans*
- 10(8). Stems appressed and commonly silvery-hairy; leaflets densely silvery-hairy; plants of Iron and Washington cos. *L. hillii*
- Stems merely strigose, appearing green; leaflets thinly strigose; plants mainly of northern Utah *L. argenteus*
- 11(6). Calyx with a gibbous-saccate spur at base of upper lip; wings pubescent, or keel ciliate below the claws (rarely glabrous) 12
- Calyx at most gibbous at base of upper lip; wings and lower edge of keel glabrous 13
- 12(11). Wings not ciliate; flowers yellow or varicolored in populations; plants of far western Utah *L. arbustus*
- Wings or keel (or both) ciliate below the claws (rarely glabrous); flowers commonly blue-purple; plants widespread *L. caudatus*
- 13(11). Banner reflexed at or below the midpoint, strigose to thinly strigose near the tip, or rarely hairy along the crest 14
- Banner reflexed beyond the midpoint, strigose on the back beneath the calyx lobe or over much of the back 15
- 14(13). Leaves mainly basal, the plants commonly less than 50 cm tall; known from Juab, Millard, Tooele, and Utah cos. *L. prunophilus*
- Leaves mainly well distributed along the stem, the plants commonly more than 50 cm tall; distribution broad *L. serviceus*
- 15(13). Stems velvety or woolly hairy; plants commonly of meadows and stream terraces in Duchesne, Salt Lake, Summit, Wasatch, Uintah, and Utah cos. *L. leucophyllus*
- Stems with appressed, ascending, spreading, or retrose hairs, but not velvety or woolly; distribution and habitat various 16
- 16(15). Stems with spreading or retrose hairs; plants of Washington Co. 17
- Stems with suppressed or ascending hairs; plants variously distributed 18
- 17(16). Flowers 7–9 mm long *L. palmeri*
- Flowers 12–16 mm long *L. jonesii*
- 18(16). Flowers semi-orbicular viewed laterally; leaflets usually oblanceolate *L. alpestris*
- Flowers narrow viewed laterally; leaflets linear-oblanceolate *L. argenteus*

Lupinus alpestris A. Nels. Mountain Lupine. Perennial, 25–65 cm tall, from a woody caudex, the basal leaves commonly deciduous by anthesis; pubescence of stems mainly strigose to strigulose or pilosulous; petioles 1.5–7 cm long; leaves mainly cauline; leaflets 7–9, 8–65 mm long, 3–14 mm wide, oblanceolate to elliptic, strigulose to strigose on both sides, sometimes sparingly so above; peduncles 0.5–4 cm long; racemes 3–59 35-flowered, 4–15 cm long in anthesis, 4–23 cm long in fruit; pedicels 2–5 mm long; flowers 8–12 mm long, blue-purple or rarely white; upper lip of calyx somewhat gibbous; banner with a central white or yellow spot, pubescent on the back near the calyx lip, reflexed above the middle; wings glabrous or rarely pubescent near the claw; keel sparingly ciliate near the apex; ovules 3–5. Sagebrush, mountain brush, pinyon-juniper, ponderosa pine, and aspen communities 1530 to 2800 m in Beaver, Box Elder, Carbon, Duchesne, Emery, Garfield, Grand, Iron, Kane, Juab, Millard, Piute, Salt Lake, San Juan, Sanpete, Sevier, Summit, Tooele, Utah, Wasatch, and Washington cos.; Saskatchewan and Montana south to Nevada, Arizona, and New Mexico. The status of mountain lupine, often cited as *L. x alpestris*, is in doubt, but is representative of the nature of taxa within the genus as a whole. Specimens occupy a morphological gradient which overlaps both *L. argenteus* sens. lat. and *L. caudatus* sens. lat. Its distribution and range of variation exceeds that of both of those taxa, however, indicating that more is involved than mere hybridization and introgression. The taxon, as described herein, serves as a kind of botanical wasteland into which those specimens are dumped which seem beyond the limits of *L. argenteus* and *L. caudatus*. The enormous range of variation is indicated in the treatment by Hess (1969), in which some 24 synonyms, mainly based on materials from Nevada, are listed for *L. alpestris*; 51 (x).

Lupinus ammophilus Greene. Sand Lupine. Plants perennial, 13–70 cm tall, from a rhizome-like subterranean caudex; pubescence of stems hirsute-pilose leaves mainly basal; petioles of lowermost leaves

(4) 8–19 cm long, those of cauline leaves 3–14 cm long; leaflets 8–11, 12–75 mm long, 4–18 mm wide, oblanceolate to obovate, pilose beneath, glabrous above; peduncles 4–13 cm long; racemes 19- to 48-flowered, 8–25 cm long in anthesis, 8–36 cm long in fruit; flowers 8–14 mm long, blue-purple or rarely white; pedicels 4.5–9 mm long; calyx gibbous at base of upper lip; banner with a central yellow or white spot, glabrous dorsally, reflexed above the midpoint; wings glabrous, keel sparingly ciliate near the apex; ovules 3–7. Sagebrush, pinyon-juniper, mountain brush, ponderosa pine, and aspen–Douglas fir woods, commonly in sandy soils at 1830 to 2730 m in San Juan Co.; Colorado and New Mexico; 10 (iii).

Lupinus arbustus Douglas ex Lindl. Spurred Lupine. Perennial, 26–60 cm tall, from a woody caudex; pubescence of stems minutely strigulose; leaves scattered along the stem, but with much shorter petioles upwards; petioles 2.5–16 cm long; leaflets 7–13, 24–50 mm long, 3–10 mm wide, oblanceolate, pilose on both surfaces; peduncles 2–5 cm long; racemes 12- to 46-flowered, the axis 2.5–18 cm long in anthesis, 4–23 cm long in fruit; flowers 10–14 mm long, yellow or white or blue-purple, or all of these in populations, or in the same raceme; pedicels 1.5–6 mm long; calyx with a gibbous-saccate spur at base of upper lip, the spur 1.5–2.5 mm long; banner with a central white, yellowish, or brownish spot, pubescent dorsally, reflexed near the midpoint, wings ciliate along the upper edge near the apex; keel ciliate along the upper margin; ovules 5 or 6. Sagebrush and pinyon-juniper communities at 2135 to 2440 m in the Deep Creek Mountains, Juab and Tooele cos.; Washington east to Montana and south to California and Nevada. Our material belongs to var. *calcaratus* (Kellogg) Welsh stat. nov. based on *Lupinus calcaratus* Kellogg Proc. Calif. Acad. Sci. 2:195. 1862. [*L. laxiflorus* var. *calcaratus* (Kellogg) Dunn]. This is one of our most beautiful species of lupine; 11 (ii).

Lupinus argenteus Pursh. Silvery Lupine. Plants perennial, 18–90 cm tall, from a superficial caudex, puberulent to strigose on

stems and petioles; leaves mainly cauline; petioles 1.5–8 cm long; leaflets 6–9, 7–95 mm long, 2–22 mm wide, oblanceolate to spatulate or almost linear, flat or folded, strigulose to strigose on both surfaces or almost to quite glabrous above; peduncles 1.5–14.5 cm long; racemes 15- to 92-flowered, 5–24 cm long in anthesis, the axis 6–29 cm long in fruit; flowers (5–7) 8.5–16 mm long, blue-purple, blue, white or rarely other hues; pedicels 1.5–6 mm long; calyx gibbous or rounded at base of upper lip; banner with a central yellow or white spot, pubescent or glabrous dorsally, reflexed

above the midpoint, the wings and keel glabrous or variously sparingly ciliate; ovules 3–6. The silvery lupine is represented in Utah by several more or less distinctive but integrading varieties. Furthermore, at least some of the phases grade further into other taxa, especially into *L. alpestris*, *L. caudatus*, and also into *L. sericeus*. Silvery lupine, along with those species, constitutes the most common and most widespread of the perennial lupines in the state. The large proportion of the specimens encountered can be segregated by use of the following, admittedly arbitrary, key.

- 1. Leaflets more or less evenly pubescent above, generally folded, the upper surface thus obscured 2
- Leaflets glabrous above, or with hairs scattered or merely with a few near the margin, flat or folded 3
- 2(1). Flowers (8) 9–11.5 mm long, narrow when viewed laterally; plants of broad distribution *L. argenteus* var. *tenellus*
- Flowers 11–14 mm long, orbicular when viewed laterally; plants of low elevations in east central Utah *L. argenteus* var. *moabensis*
- 3(1). Leaflets commonly folded, narrowly oblanceolate; banner usually pubescent beneath the upper lip of calyx; keel ciliate near the apex; plants of low to moderate elevations 4
- Leaflets commonly flat, oblanceolate to broadly so; banner usually glabrous dorsally, the keel margin glabrous or hairy only near the apex; plants of moderate to high elevations 5
- 4(3). Wings 4.5–6 mm wide; flowers 10–15 mm long, orbicular when viewed laterally; plants of central to eastern Utah *L. argenteus* var. *argenteus*
- Wings 3–4.5 mm wide; flowers 8–11.5 mm long, narrow when viewed laterally; plants mainly of central to western Utah *L. argenteus* var. *tenellus*
- 5(3). Keel densely ciliate near the apex; flowers 5–7 mm long; plants uncommon in Utah, passing into the following varieties *L. argenteus* var. *parviflorus*
- Keel moderately to sparingly ciliate near the apex; flowers commonly .8 mm long or more; plants common at high elevations 6
- 6(5). Flowers spreading at anthesis; stems slender, often suffused with red near the base *L. argenteus* var. *rubricaulis*
- Flowers pendant at anthesis; stems stout, seldom red at the base
..... *L. argenteus* var. *boreus*

Var *argenteus* [*L. garrettianus* C. P. , Sevier, Uintah, and Wayne cos.; Alberta Smith, type from 1 mile west of Duchesne]. and Saskatchewan south to Oregon, California, Grasslands, river terraces, sagebrush, and Nevada, New Mexico, and the Dakotas. pinyon-juniper communities at 1575 to 3050 In Utah this variety passes mainly into var. m in Carbon, Duchesne, Garfield, San Juan, *tenellus* and var. *moabensis*. From the latter

it differs inter alia in pubescence position on the leaves; 27 (xi).

Var. *boreus* (C. P. Smith) Welsh comb. nov. based on *Lupinus spathulatus* var. *boreus* C. P. Smith, Species Lupinorum 746. 1952. [*L. spathulatus* Rydb., type from Wasatch Mts.; *L. alsophilus* Greene.] Spruce-fir woods, meadows, aspen, mixed conifer, and upper mountain brush communities at 2370 to 3350 m in Beaver, Carbon, Davis, Emery, Garfield, Iron, Piute, Salt Lake, Sanpete, Sevier, Summit, Utah, and Wasatch cos.; Montana and South Dakota, south to Wyoming and Colorado. The spathulate lupine forms almost a continuum with var. *rubricaulis*. They are approximately sympatric in about the same kinds of habitats through much of their ranges; 20 (viii).

Var. *moabensis* (Dunn & Harmon) Welsh stat. nov. based on *Lupinus argenteus* ssp. *moabensis* Dunn & Harmon. Mixed desert shrub and pinyon-juniper communities, often in washes, at 1400 to 1630 m in Grand and Wayne cos.; Colorado. The Moab lupine differs from var. *argenteus*, with which it is closely allied, in the features emphasized in the key. Further differential characteristics are to be found in the very early flowering time of the Moab lupine. However, this is at least partly a response to the earlier season of the lower elevation habitats, and might not be genetic; 7 (iii).

Var. *parviflorus* (Nutt.) C. L. Hitchc. [*L. parviflorus* Nutt. ex Hook. & Arn.; *L. argenteus* ssp. *parviflorus* (Nutt.) Phillips]. Spruce-fir, lodgepole pine, and aspen communities at 2270 to 2730 m in Duchesne, Salt Lake, Summit, and San Juan cos.; Idaho, Wyoming, and Colorado. Our material is mostly intermediate towards one or more of the varieties of *L. argenteus*, especially with those that occur at higher elevations; 4 (0).

Var. *rubricaulis* (Greene) Welsh comb. nov. based on *Lupinus rubricaulis* Greene, Pl. Baker. 3:35. 1901. [*L. caudatus* var. *rubricaulis* (Greene) C. P. Smith]. Spruce-fir, meadow, mixed conifer, aspen, and riparian communities at 2470 to 3370 m in Beaver, Carbon, Daggett, Duchesne, Garfield, Iron, Piute, Sanpete, Sevier, Summit, Uin-

tah, Utah, and Wasatch cos.; Idaho, Montana, and South Dakota, south to Nevada and New Mexico. The red-stemmed lupine differs in degree only from var. *boreus*, and the two might best be treated as variants within a single variety. If they are so treated, then the name becomes var. *rubricaulis* as that name has priority in rank. Specimens from the north slope of the Uinta Mts. (Welsh 1584 BRY; Goodman 527, 169 RM) are apparently intermediate towards the more northern *L. monticola* Rydb.; 38 (xvi).

Var. *tenellus* (Douglas) Dunn. [*L. tenellus* Douglas ex G. Don; *L. laxiflorus* var. *tenellus* (Douglas) T. & G.; *L. foliosus* var. *stenophyllus* Nutt.; *L. stenophyllus* (Nutt.) Rydb.; *L. argenteus* var. *stenophyllus* (Nutt.) Davis]. Sagebrush, pinyon-juniper, mountain brush, aspen, grassland, and mixed conifer communities at 1570 to 3130 m in Cache, Carbon, Davis, Duchesne, Garfield, Grand, Juab, Millard, Piute, Salt Lake, San Juan, Sevier, Uintah, Utah, Wasatch, and Washington cos.; Alberta and Saskatchewan south to California, Arizona, New Mexico, and the Dakotas. The slender lupine is most similar to var. *argenteus*, from which it differs mainly in size of flowers that average smaller (9–11.5 mm, not 10–16). It is with this phase of *L. argenteus* that *L. alpestris* is most easily mistaken. Indeed, there is no clear way to distinguish all specimens as belonging to one or to the other; 28 (xii).

***Lupinus brevicaulis* S. Wats.** Short-stemmed Lupine. Annual, 4–11 cm tall, from a taproot; cotyledons sessile; stems 0–2 cm long, when developed at all usually obscured by the leaf bases; leaves in a basal tuft; petioles 0.8–6.5 cm long; leaflets 3–9, 5–18 mm long, 1.5–9 mm wide, oblanceolate, flat or folded, pilose beneath, glabrous above (except marginally in some); peduncles 0.6–6.5 cm long; racemes 4- to 12-flowered, 1–2.5 cm long in anthesis, the axis 1.5–3 cm long in fruit; flowers 5.2–7 mm long, blue-purple or white; pedicels 0.3–0.8 mm long; calyx tapering to the pedicel, the upper lip very short; banner with a central yellow spot, glabrous dorsally, reflexed near the midpoint; ovules 2 or 3. Salt desert shrub, pinyon-juniper, sagebrush, blackbrush,

and creosote bush communities at 830 to 1970 m in Beaver, Carbon, Daggett, Garfield, Millard, Salt Lake, Uintah, Utah, and Washington cos.; Oregon east to Colorado, and south to Arizona and New Mexico. The short-stemmed lupine forms apparent hybrids with *L. flavoculatus*; 18 (i).

Lupinus caespitosus Nutt. ex Torr. & Gray. Stemless Lupine. [*L. aridus* var. *utahensis* S. Wats., type from Parley's Park; *L. watsonii* Heller; *L. lepidus* var. *utahensis* (S. Wats.) C. L. Hitchc.; *L. lepidus* ssp. *caespitosus* (Nutt.) Detling]. Perennial, caespitose, 2.5–11.5 cm tall, acaulescent or essentially so, from a superficial caudex; leaves mainly basal; petioles 1–9 cm long; leaflets 5–9, 3–25 mm long, 1.5–6 mm wide, oblanceolate, mucronate, pilose on both sides; peduncles 0–2 cm long; racemes 12- to 40-flowered, 1–4 cm long in anthesis, the axis 2–6 cm long in fruit; flowers 7–8.5 mm long, blue-purple or white; pedicels 2.5–4 mm long; calyx tapering to the pedicel, the upper lip well developed; banner with a central yellow spot, glabrous dorsally, reflexed below the midpoint; ovules 2–4. Meadows, open deciduous woodland, mixed conifer, and sagebrush communities at 2130 to 3350 m in Beaver, Cache, Carbon, Emery, Grand, Kane, Garfield, Iron, Piute, Sanpete, Sevier, Summit, Uintah, Utah,

Wasatch, and Wayne cos.; Oregon to Montana and south to California, Nevada, and Colorado. This distinctive taxon has been treated as belonging to an expanded *L. lepidus* Dougl. ex Lindl., but seems best recognized at specific rank, in our flora at least; 33 (xi).

Lupinus caudatus Kellogg. Spurred Lupine. Perennial, 21–80 cm tall, from a woody caudex; leaves mainly cauline; petioles 1–12 cm long, commonly 2–8 cm long; leaflets 5–90, 10–45 (60) mm long, 2–14 cm wide, oblanceolate to elliptic or narrowly oblanceolate, pilose on both surfaces or glabrate above; peduncles 1–6.5 cm long; racemes 10- to 57-flowered, 3–16 cm long in anthesis, the axis 4.5–17 cm long in fruit; flowers 8–12.5 (13.5) mm long, blue-purple or less commonly white; pedicels 1–3 (5) mm long; calyx with a gibbous-saccate spur 0.2–1.5 (2) mm long at the base of the upper lip; banner pubescent dorsally, reflexed at or beyond the midpoint; wings commonly ciliate above and near the claws, the keel commonly ciliate above and near the claws; ovules 3–5. Three rather weak varieties are known from Utah. They are separable only arbitrarily, but seem to represent at least trends within the variation.

- 1. Banner reflexed at the midpoint; leaflets rather broadly oblanceolate; plants rare in Kane Co. *L. caudatus* var. *cutleri*
- Banner reflexed beyond the midpoint; leaflets only rarely broadly oblanceolate; plants of various distribution 2
- 2(1). Leaflets bicolored, green to yellow-green above, dull green to grayish beneath; plants uncommon, of southern Utah *L. caudatus* var. *argophyllus*
- Leaflets more uniformly colored, either green or gray on both surfaces, or only somewhat bi-colored; plants common in much of Utah *L. caudatus* var. *caudatus*

Var. *argophyllus* (A. Gray) Welsh stat. nov. based on *Lupinus decumbens* var. *argophyllus* A. Gray Mem. Amer. Acad. 4:37. 1849. [*L. caudatus* ssp. *argophyllus* (A. Gray) Phillips; *L. argophyllus* (A. Gray) Cockerell; *L. laxiflorus* var. *argophyllus* (A. Gray) M. E. Jones; *L. helleri* Greene; *L. aduncus* Greene]. Pinyon-juniper, mountain brush, ponderosa pine, and grassland com-

munities at 1570 to 2430 feet in Beaver, Garfield, Kane, and San Juan cos.; Wyoming south to New Mexico; 7 (iii).

Var. *caudatus*. [*L. holosericeus* var. *utahensis* S. Wats., type from Wasatch Mts.; *L. argentinus* Rydb.; *L. lupinus* Rydb., type from Bears Ears, Elk Mt.; *L. utahensis* Moldenke]. Sagebrush, pinyon-juniper, mountain brush, ponderosa pine, aspen, mixed

conifer, and grassland communities at 1470 to 2730 m in Beaver, Box Elder, Cache, Davis, Duchesne, Garfield, Iron, Juab, Kane, Millard, Morgan, Piute, Rich, Salt Lake, San Juan, Tooele, Uintah, Utah, Wasatch, Wayne, and Weber cos.; Oregon, Idaho, and Wyoming south to California, Nevada, Arizona, and Colorado. This variety forms intermediates with *L. argenteus* (especially with var. *tenellus*), *L. hillii*, *L. sericeus*, and the other varieties of *L. caudatus*; 67 (vii).

Var. *cutleri* (Eastw.) Welsh stat. nov. based on *Lupinus cutleri* Eastw., Leaf. West. Bot. 4:192. 1945. [*L. caudatus* ssp. *cutleri* (Eastw.) Hess]. Pinyon-juniper woodland at 1570 m along the Cockscomb in Kane Co.; Arizona, Colorado, and New Mexico; 1 (i).

***Lupinus concinnus* Agardh.** Elegant Lupine. [*L. micensis* M. E. Jones; *L. orcuttii* S. Wats.; *L. concinnus* ssp. *orcuttii* (S. Wats.) Dunn.] Annual, caulescent, 6.5–20 cm tall, from a taproot; cotyledons petiolate; stems with apparent internodes; leaves mainly cauline, the lowermost the smallest; petioles 0.6–8 cm long; leaflets 5–8, 4–24 mm long, 1.5–7.5 mm wide, obovate to oblanceolate, pilose on both sides; peduncles 0.4–2 cm long; racemes 6- to 17-flowered, 2–4 cm long in anthesis, the axis 4–7 cm long in fruit; flowers 7–8.8 mm long, blue-purple (rarely white); pedicels 0.5–1.2 mm long; calyx tapering to the pedicel; upper lip well developed; banner with a central yellow spot, glabrous dorsally, reflexed at or below the midpoint; ovules 2–4. Warm desert shrublands at 770 to 1070 m in Washington Co.; New Mexico, Arizona, and Nevada. Our material belongs to var. *orcuttii* (S. Wats.) C. P. Smith; 10 (ii).

***Lupinus flavoculatus* Heller.** Yellow-eyed Lupine. [*L. rubens* var. *flavoculatus* (Heller) C. P. Smith; *L. odoratus* var. *flavoculatus* (Heller) Jepson]. Annual, 3–11 cm tall, from a taproot; cotyledons sessile; stems 0–2 cm long, often with at least one apparent internode; leaves mainly basal; petioles 0.5–8.5 cm long; leaflets 6–10, 5–20 mm long, 2–9 mm wide, obovate to oblanceolate, flat or folded, pilose to glabrate beneath, glabrous above, long ciliate; peduncles 1.5–7.5 cm long; racemes 9- to 16-flowered, 1.2–3 cm

long in anthesis, the axis 2–4 cm long in fruit; flowers 5.1–7.2 mm long, blue-purple or less commonly white; pedicels 0.5–2 mm long; calyx tapering to the pedicel, the upper lip short; banner with a central yellow spot, glabrous dorsally, reflexed near the midpoint; ovules 2–4. Warm desert shrub and pinyon-juniper communities at 770 to 2330 m in Washington Co.; Nevada and California. This plant apparently hybridizes with *L. brevicaulis*, from which it cannot be separated in all cases. Possibly, the yellow-eyed lupine might best be treated at some infraspecific level within that taxon; 5(0).

***Lupinus hillii* Greene.** Hill Lupine. [*L. pulcher* Eastw., type from 18 miles south of Cedar City]. Perennial, 24–65 cm tall, from a woody caudex; leaves mainly cauline; petioles 0.6–8 cm long; leaflets 5–9, 7–46 mm long, 2–8 mm wide, oblanceolate to narrowly so, often folded, pilose on both surfaces though less densely so above; peduncles 0.5–18 cm long; racemes 24- to 73-flowered, 5–20 cm long in anthesis, the axis 6–23 cm long in fruit; flowers 6–8.5 mm long, blue-purple; pedicels 2–4.5 mm long; calyx gibbous at base of upper lip; banner with a central yellow spot, glabrous dorsally, reflexed near the midpoint; ovules 2 or 3. Sagebrush and pinyon-juniper to ponderosa pine communities at 2130 to 2730 m in Pine Valley Mts., Washington and Iron cos.; Arizona. The Hill lupine approaches, if not passes into, *L. palmeri* on the one hand, and into *L. caudatus* on the other. Much more material is necessary for an adequate interpretation of our somewhat meager specimens; 6 (ii).

***Lupinus jonesii* Rydb.** Jones Lupine. Perennial, 50–120 cm tall, from a woody caudex; pubescence of stems spreading-hirsute; leaves mainly cauline; petioles 1–8 cm long; leaflets 6–9, 9–60 (70) mm long, 3–13 mm wide, oblanceolate to oblong-oblanceolate, folded or flat, pilose on both surfaces; peduncles 4.5–12 cm long; racemes 18- to 65-flowered, 8–28 cm long in anthesis, the axis 9–30 cm long in fruit; flowers 12–15 (16) mm long, pallid, or blue-purple; pedicels 2–5 mm long; calyx strongly gibbous at base of upper lip; banner with a central yellow or brown spot, more or less strigose dor-

sally, reflexed at or beyond the midpoint; ovule number not known. Pinyon-juniper and mountain brush communities at 1170 to 2330 m in Washington Co. (type from Silver Reef); endemic. Affinities of *L. jonesii* appear to lie with *L. sericeus* through var. *barbiger*; 3(0).

***Lupinus kingii* S. Wats.** King Lupine. [*L. sileri* S. Wats., type from southern Utah; *L. capitatus* Greene]. Annual, 6–24 cm tall, from a taproot; cotyledons sessile; stems with two or more apparent internodes; leaves mainly cauline; petioles 0.8–3.5 cm

long; leaflet 5–7, 7–23 mm long, 2–6.5 mm wide, oblanceolate, flat or folded, long-pilose on both surfaces or glabrous medially above or overall; peduncles 0–9.5 cm long; racemes 5- to 12-flowered, 1–2.3 cm long at anthesis, the axis 1.8–3.7 cm long in fruit; flowers 7.8–9.2 mm long, blue purple or less commonly pallid; calyx somewhat gibbous at base of upper lip; banner with a central yellow spot, glabrous dorsally, reflexed below the midpoint; ovules usually 2. Two varieties are present.

1. Racemes sessile, the peduncles obsolete, contained within the foliage *L. kingii* var. *argillaceus*
- Racemes pedunculate, the peduncles 1–9.5 cm long, commonly produced beyond the foliate *L. kingii* var. *kingii*

Var. *argillaceus* (Woot. & Standl.) C. P. Smith. (*L. argillaceus* Woot. & Standl.) Pinyon-juniper woodland at 2400 m in the Henry Mts., Garfield Co.; New Mexico. This is a striking phase, which is evidently rare in Utah; 1 (0).

Var. *kingii*. Sagebrush, pinyon-juniper, mountain brush, and ponderosa pine communities at 1830 to 2440 m in Garfield, Iron, Kane, Piute, San Juan, Sevier, Wasatch (type from Heber Valley), and Washington cos.; Nevada, Arizona, New Mexico, and Colorado. 24 (iv).

***Lupinus latifolius* Agardh.** Broad-leaved Lupine. Perennial, 30–120 cm tall, from a branching caudex; pubescence appressed strigose or almost lacking; leaves mainly cauline; petioles 4–20 cm long, leaflets 5–11, 25–90 mm long, 4–20 mm wide, oblong to elliptic or oblanceolate, flat, glabrous above, thinly appressed-strigose beneath; racemes 10- to 35-flowered, 8–25 cm long in anthesis, 10–40 cm long in fruit; flowers 10–14 cm long, blue to pinkish, fading brown; pedicels 6–12 mm only; calyx not gibbous at the base; banner with a central yellow spot; glabrous dorsally, reflexed below the midpoint; ovules 7–10. Oakbrush and streamside communities at ca. 1230 m in Washington (Zion National Park) Co.; California, Oregon, Washington. Our materials appear to belong to var. *columbianus*

(Heller) C. P. Smith. [*L. columbianus* Heller] 2(0).

***Lupinus leucophyllus* Dougl. ex Lindl.** White-leaved Lupine. [*L. eatonanus* C. P. Smith, type from Hailstone]. Perennial, 40–90 cm tall or more, from a woody caudex; pubescence of stems dense, appressed to spreading; leaves mainly cauline; petioles 1.2–16 cm long; leaflets 7–10, 9–70 mm long, 3–13 mm wide, oblanceolate, flat or folded, villous-pilose on both surfaces; peduncles 2.5–5.5 cm long; racemes 22- to 70-flowered, 7–18 cm long in anthesis, the axis 8–19 cm long in fruit; pedicels 2.5–5 mm long; flowers 10–15 mm long, blue-purple or less commonly pallid; calyx gibbous to saccate-gibbous at base of upper lip; banner with a central yellow spot, densely hairy dorsally, reflexed above the midpoint; ovules 4–6. Terraces at 1450 to 2300 m in Duchesne, Summit, Uintah, Utah, and Wasatch cos.; Washington south to Nevada and east to Wyoming. The white-leaved lupine forms apparent hybrids with *L. caudatus*, among others; 9 (iv).

***Lupinus maculatus* Rydb.** Spotted Lupine. Perennial, 40–85 cm tall, from a woody caudex; pubescence of stems appressed or subappressed or lacking; leaves mainly cauline; petioles 1.8–4 cm long; leaflets 5–8, 14–75 mm long, 2.5–18 mm wide, oblanceolate, mainly flat, sparingly pilose

beneath, glabrous above, ciliate, obtuse to acute apically; peduncles 0.8–9 cm long; racemes 20- to 39 (50)-flowered, 5–15 (23) cm long in anthesis, the axis 8–25 cm long in fruit; pedicels 2–5 mm long; flowers 8.5–14 mm long, blue-purple or white, fading tan; calyx more or less gibbous at base of upper lip; banner with a central brown (or fading brown) spot, glabrous dorsally, reflexed above the midpoint; ovules 4 or 5. Aspen-conifer, meadow, and open conifer communities at 2230 to 2730 m in Davis, Salt Lake (?), Sevier, Utah [type from P. V. (Pleasant Valley) Junction], and Weber cos.; Idaho. Spotted lupine is a near ally of *L. argenteus* var. *boreus* and var. *rubricaulis*, with which it forms apparent hybrids. Perhaps it would best be treated at infraspecific rank in that species; 10 (i).

Lupinus palmeri S. Wats. Palmer Lupine. Perennial, 24–60 cm tall, from a woody caudex; pubescence of stems more or less spreading-ascending (at least some); leaves mainly cauline; petioles 0.8–10 cm long; leaflets 6–10, 10–48 mm long, 3–8 (10) mm wide, oblanceolate, flat or folded, pilose on both surfaces; peduncles 0.5–5.5 (7) cm long; racemes 14- to 55-flowered, 4–15 cm long in anthesis, the axis 12–20 cm long in fruit; flowers 1.5–11 mm long, blue-purple; pedicels 1.2–4 mm long; calyx more or less gibbous at base of upper lip; banner with a central yellow spot, usually pubescent dorsally, reflexed at or beyond the midpoint; ovules 2–6. Pinyon-juniper and sagebrush communities at 1830 to 2130 m in Washington Co.; Nevada, Arizona, and New Mexico. The Palmer lupine, as it is known in Utah, is closely related to *L. hillii*, from which it is distinguished with some difficulty. Additional materials might dictate a change in status for this poorly known entity; 5(0).

Lupinus prunophilus M. E. Jones. Robinson Lupine. [*L. wyethii* var. *prunophilus* (M. E. Jones) C. P. Smith; *L. arcticus* var. *prunophilus* (M. E. Jones) C. P. Smith; *L.*

polyphyllus ssp. *polyphyllus* var. *prunophilus* (M. E. Jones) Phillips; *L. tooelensis* C. P. Smith, type from Johnson Canyon, Deep Creek Mts.] Perennial, 23–65 cm tall, from a woody caudex; pubescence of stems spreading-hirsute; leaves mainly basal; petioles of lowermost leaves 7–30 cm long; leaflets 8–13, 15–75 above; peduncles 4–10 cm long; racemes 25- to 68-flowered, 6–23 cm long, the axis 8–35 cm long in fruit; flowers 10–16 mm long, blue-purple; pedicels 3.5–8 mm long; calyx gibbous at base of upper lip; banner with a yellow spot, glabrous dorsally, reflexed near the midpoint; wings glabrous; keel sparingly ciliate near the apex; ovules 3–6. Sagebrush, pinyon-juniper, and mountain brush communities at 1530 to 2130 m in Juab (type from Robinson), Millard, Tooele, and Utah cos.; Washington south to Nevada and east to Montana, Wyoming, and Colorado. The Robinson lupine has been regarded by Hess (1969) as *L. x prunophilus*, but that designation seems inconsistent with the material at hand. The populations in Utah are better defined than some of the other taxa treated as species; 13 (ii).

Lupinus pusillus Pursh. Dwarf Lupine. Annual, 3–24 cm tall, from a taproot; cotyledons sessile; pubescence of stems and petioles spreading long-hairy; leaves mainly cauline; petioles 1–9 cm long; leaflets 3–9 (14), 11–48 mm long, 2–10 mm wide, oblanceolate, flat or folded, long-pilose beneath, glabrous above; peduncles 0.5–3.5 cm long; racemes 4- to 38-flowered, 1–17 cm long in anthesis, the axis 4–21 cm long in fruit; flowers 8.5–12 mm long, blue or variously pink or white; pedicels 1–3.5 mm long; calyx tapering to the pedicel; banner with a central yellow spot, glabrous dorsally, reflexed near the midpoint; ovules 2; pods constricted between the seeds. Three poorly differentiated and intergrading varieties are present in Utah. The following arbitrary key will serve to segregate most materials.

1. Peduncles seldom more than 1 cm long; inflorescence shorter than the leaves; banner 5 mm wide or less *L. pusillus* var. *intermontanus*
- Peduncles commonly 1–3.5 cm long; inflorescence usually longer than the leaves; banner 6–10 mm wide 2

- 2(1). Calyx tube and pedicel glabrous; corolla commonly blue; plants completely transitional with the next *L. pusillus* var. *rubens*
- Calyx tube and pedicel pilose; corolla blue or pale to white
..... *L. pusillus* var. *pusillus*

Var. *intermontanus* (Heller) C. P. Smith. [*L. intermontanus* Heller; *L. pusillus* ssp. *intermontanus* (Heller) Dunn]. Dunes and other sandy sites in mixed desert shrub, pinyon-juniper, and mountain brush communities at 1130 to 1770 m in Duchesne, Emery, Garfield, Kane, Millard, Salt Lake, San Juan, Tooele, and Wayne cos.; Arizona, California, Idaho, Montana, Nevada, Oregon, Washington, and Wyoming. The long-hairy raceme axis and pedicels, along with the narrow banner and the short racemes, are diagnostic; 23 (iv).

Var. *pusillus*. Salt desert shrub, mixed desert shrub, and pinyon-juniper communities, commonly in sand, at 1230 to 1970 m in Emery, Garfield, Grand, Kane, San Juan, Uintah, and Wayne cos.; Alberta and Saskatchewan south to Arizona, New Mexico, and Kansas; 39 (ix).

Var. *rubens* (Rydb.) Welsh stat. nov. based on *Lupinus rubens* Rydb., Bull. Torrey Bot. Club 34:45. 1907. [*L. odoratus* var. *rubens* (Rydb.) Jepson; *L. pusillus* ssp. *rubens* (Rydb.) Dunn]. Mixed desert shrub and blackbrush communities, commonly in sand, at 800 to 1650 m in Garfield, San Juan, Washington (type from St. George), and Wayne cos.; Nevada, Arizona, and Colorado; 7 (ii). The maintenance of var. *rubens* in any taxonomic rank is dubious, since the main diagnostic features, i.e., the glabrous

pedicel and calyx tube, do not fall into an either/or situation. Never-the-less, the phase of low elevations, mainly in Washington Co., do represent a trend, which, although based on this tenuous pubescence feature alone, seems worthy of taxonomic recognition.

***Lupinus sericeus* Pursh.** Silky Lupine. Perennial, 30–120 cm tall, from a branching caudex; pubescence of stems short-villous to pilose or strigose, sometimes spreading; petioles 1.2–9 cm long; leaflets 5–9, 7–78 mm long, 2–15 mm wide, oblanceolate, commonly flat (at least some), pilose to puberulent on both surfaces or glabrous to glabrate above; peduncles 1.3–9 cm long; racemes 14- to 70-flowered, 6–28 cm long in anthesis, the axis 8–37 cm long in fruit; flowers 10–16 mm long, blue, blue-purple, pale, or white; pedicels 2–7 mm long; calyx more or less gibbous at the base of upper lip; banner with yellow or brown eyespot, strigose along the dorsal crest or more widely; ovules 5–7. Widely distributed in Utah, and constituting one of the three important species complexes in the state, *L. sericeus*, along with *L. argenteus* and *L. caudatus*, occupy most of the range available to perennial lupines. Three main population types are segregated in the following key.

- 1. Flowers white in populations, the eyespot and veins commonly dark brown or fading dark brown; plants mostly from Sevier Co. southward
..... *L. sericeus* var. *barbiger*
- Flowers commonly blue or blue-purple in populations, intergrading with the preceding when in contact, the eyespot yellow or brown 2
- 2(1). Leaflets sparingly pubescent to glabrous above; plants mostly of central southern Utah; intergrading with the following *L. sericeus* var. *marianus*
- Leaflets uniformly puberulent to pilose above; plants of broader distribution
..... *L. sericeus* var. *sericeus*

Var. *barbiger* (S. Wats.) Welsh comb. nov. based on *Lupinus barbiger* S. Wats., Proc. Amer. Acad. 8:528. 1873. [*L. leu-*

canthus Rydb., type from Springdale]. Sagebrush and mountain brush communities at 1930 to 2730 m in Garfield, Kane (type

from Kane Co.), Piute, Sevier, Washington, and Wayne cos.; endemic. This is the common white-flowered variety of south-central Utah; it forms intermediates at points of contact with both var. *sericeus* and var. *marianus*; 29 (xiii).

Var. *marianus* (Rydb.) Welsh stat. nov. based on *Lupinus marianus* Rydb. Bull. Torrey Bot. Club 34:41. 1907. [*L. sericeus* ssp. *marianus* (Rydb.) Fleak & Dunn]. Sagebrush, pinyon-juniper, mountain brush, ponderosa pine, aspen, and spruce-fir communities at 1770 to 2870 m in Garfield, Piute (type from Bullion Creek), and Sevier cos.; endemic; 8 (iv).

Var. *sericeus*. [*L. aegra-ovium* C. P. Smith, type from Salina Canyon; *L. huffmanii* C. P. Smith, type from Salina Canyon; *L. sericeus* ssp. *huffmanii* (C. P. Smith) Fleak & Dunn; *L. larsonanus* C. P. Smith, type from Salina Canyon; *L. puroviridis* C. P. Smith, type from Salina Canyon; *L. quercus-jugi* C. P. Smith, type from Salina Canyon vicinity; *L. rickeri* C. P. Smith, type from Salina Canyon; *L. salinensis* C. P. Smith, type from Salina Canyon; *L. egglestonianus* C. P. Smith; *L. flexuosus* Lindl.; *L. sericeus* var. *flexuosus* (Lindl.) C. P. Smith]. Sagebrush, mountain brush, pinyon-juniper, ponderosa pine, aspen, spruce-fir and meadow communities at 1770 to 3130 m in Beaver, Carbon, Emery, Garfield, Grand, Juab, Kane, Piute, Salt Lake, Sevier, Summit, Tooele, Utah, Wasatch, Wayne, and Weber cos.; British Columbia east to Alberta and south to California, Arizona, and New Mexico; 60 (xxv).

Lupinus sparsiflorus Benth. Mohave Lupine. Annual, 9–38 cm tall, from a taproot; cotyledons sessile; pubescence of stems appressed or ascending, of two lengths; leaves mainly cauline; petioles 1.4–8 cm long; leaflets 5–9, 5–35 mm long, 1–4 mm wide, elliptic-oblong to oblanceolate, flat or folded, long-pilose on both surfaces, less densely hairy above; peduncles 1.3–5 cm long; racemes 8- to 46-flowered, 4–23 cm long in anthesis, the axis 6–29 cm long in fruit; flowers 8.5–11 mm long, blue-purple or rarely white; pedicels 2–5 mm long; calyx gibbous at base or upper lip; banner with a central yellow spot, glabrous dorsally, re-

flexed beyond the midpoint; ovules 4–6. Joshua tree, creosote bush, and mixed warm desert shrub communities at 670 to 1100 m in Washington Co.; Arizona, Nevada, California, and Mexico. Our material belongs to var. *mohavensis* (Dziekanowski & Dunn) Welsh stat. nov. based on *Lupinus sparsiflorus* ssp. *mohavensis* Dziekanowski & Dunn Aliso 6:48. 1966; 10 (ii).

Lupinus volutans Greene. Rolled Lupine. Perennial, 15–40 cm tall, caespitose from a branching caudex, short-caulescent; pubescence of stems long pilose; leaves mainly basal; petioles 4–19 cm long; leaflets 5–7, 6–40 mm long, 2–9 mm wide, oblanceolate to elliptic, flat or folded, long pilose on both surfaces, less densely so above; peduncles 0.8–3 cm long; racemes 28- to 85-flowered, 6–23 cm long in anthesis, the axis 10–30 cm long in fruit; flowers 12–14 mm long, blue-purple; pedicels 1–3 mm long; calyx only somewhat gibbous at base of upper lip; banner with a central yellow spot, glabrous dorsally, reflexed at or below the midpoint; ovules 3 or 4. Sagebrush and pinyon-juniper communities at 1670 to 1850 m in southwestern Iron and northwestern Washington cos.; Nevada. The rolled lupine is allied to the *Lupinus lepidus* complex, and has been included by some authors as a synonym of phases of that group. In Utah it is a distinctive plant, with its nearest ally being *L. caespitosus*, from which it differs both morphologically and ecologically; 2 (i).

Lupinus wyethii S. Wats. Wyeth Lupine. Perennial, 19–45 cm tall, from a branching superficial or scarcely subterranean caudex; pubescence of stem appressed-ascending, of two lengths; leaves basal and cauline; petioles of lowermost leaves 3.5–13 cm long; leaflets 6–9, 8½–13 mm long, 1.2–7 mm wide, narrowly oblanceolate, commonly folded, pilose on both surfaces; peduncles 3.5–11 cm long; racemes 13- to 49-flowered, 9–30 cm long in anthesis, the axis 10–35 cm long in fruit; flowers 10–13.5 mm long, blue-purple; pedicels 3–8 mm long; calyx gibbous to saccate-spurred at base of upper lip; banner with a yellow eyespot, glabrous dorsally, reflexed near the midpoint; wings glabrous dorsally, reflexed near the midpoint; wings glabrous; keel ciliate along the

upper margin near the apex; ovules 5 or 6. Wash bottoms and terraces or rimrock in pinyon-juniper and riparian communities at 1470 to 1900 m in Duchesne, Kane, and Uintah cos.; British Columbia east to Saskatchewan and south to Washington, Idaho, and Wyoming. Our material differs from the main body of specimens considered as belonging within var. *wyethii*, whose range is mostly north of the Utah outliers. Specimens from Kane Co. differ from the northern materials in having fewer leaflets (6-9, not 8-13), in possessing petioles which average shorter, and in more attenuate racemes. There are additional more subtle differences. Possibly this population is worthy of taxonomic recognition; 12 (iv).

MEDICAGO L.

Plants annual or perennial herbs, caulescent, from a taproot or a caudex; leaves alternate, pinnately trifoliate, the leaflets serrate in the distal half or less; stipules herbaceous, often toothed; flowers papilionaceous, borne in axillary, pedunculate racemes or heads; bracts subulate; calyx 5-toothed; petals 5, yellow, white, blue, pink, lavender, or purple; stamens 10, diadelphous; ovary enfolded by the staminal sheath, the style subulate, irritable; pods curved to spirally coiled, 1- to several-seeded, indehiscent, reticulate or spiny.

- 1. Flowers 2-3 mm long; inflorescence less than 10 mm long in anthesis; pods coiled through a single spiral, 1-seeded, unarmed; plants annual, prostrate to decumbent or rarely erect *M. lupulina*
- Flowers 4-10 mm long; inflorescence longer than 10 mm long (including flower length), or pods differing from above; plants various 2
- 2(1). Flowers 4-5 mm long, yellow, 2-5 per raceme; racemes less than 10 mm long; pods armed with prickles, several-seeded; plants annual *M. polymorpha*
- Flowers 6-10 mm long, yellow or blue, lavender, pink, purple, or white, 6 to many on at least some racemes; racemes longer than 10 mm; pods unarmed, several-seeded; plants usually perennial 3
- 3(2). Flowers yellow (sometimes tinged violet); pods merely curved; plants uncommon *M. falcata*
- Flowers blue, pink, lavender, purple, or white; pods spirally coiled; plants abundant to common *M. sativa*

Medicago falcata L. Yellow Alfalfa. Perennial (rarely functionally annual), 40-100 cm tall or more, the stems erect or ascending, strigulose; stipules 4-12 mm long, persistent, conspicuously veined; leaves short-petiolate, the leaflets linear, oblong, oblanceolate, or elliptic, 6-20 mm long, 1-6 (10) mm wide, few-toothed, tridentate or merely apiculate apically, strigulose beneath; peduncles subequal to the subtending leaves or longer; racemes 6- to 20-flowered, mostly 10-20 mm long; flowers 6-9 mm long, yellow, sometimes suffused with violet; calyx campanulate, the tube 1-2 mm long, the teeth 1.5-3 mm long, lance-subulate; pods 6-10 mm long, merely curved, unarmed, several-seeded. Sparingly cultivated forage

plant, escaping and persisting; introduced from the Old World. The yellow alfalfa forms hybrids with *M. sativa*, and is sometimes considered as a phase of that species; 2 (i).

Medicago lupulina L. Black Medick, Hop Clover. Annual, the stems prostrate to decumbent or sometimes erect, 10-40 cm long; stipules entire or nearly so, 3-6 mm long, persistent; leaves short-petiolate, the leaflets cuneate to obcordate, 4-15 mm long, 2-12 mm wide, toothed in the apical one-third (rarely more), pubescent to glabrous; peduncles mostly equaling or surpassing the subtending leaves; racemes 6-to 25-flowered, less than 10 mm long at anthesis (to 25 mm long in fruit); flowers 2-3

mm long, yellow; calyx campanulate, about 1 mm long; pods spiral through about 1 coil, unarmed, 1-seeded. Introduced weedy species of lawns, fields, and other sites in much of Utah (Cache, Garfield, Juab, Kane, Piute, Rich, Salt Lake, San Juan, Summit, Utah, Wasatch, Washington, and Weber cos.), where it should be considered as cosmopolitan; introduced from Europe; 35 (v).

Medicago polymorpha L. Bur Clover. (*M. hispida* Gaertn.). Annual, the stems prostrate to erect, 10-40 cm long; stipules deeply divided into long teeth, mostly 3-7 mm long; leaves short-petiolate, the leaflets cuneate to obovate or obcordate, 10-25 mm long, 6-18 mm wide, toothed in the apical one-third or more, pubescent to glabrous; peduncles mostly shorter than the subtending leaves; racemes 2- to 5-flowered, less than 10 mm long; flowers 4-5 mm long, yellow; calyx campanulate, the tube 1-1.5 mm long, the lance-subulate teeth 1-2 mm long; pods spirally coiled, armed with spines, several-seeded. Rare weedy species of cultivated land in Utah, but to be expected almost anywhere; introduced from Europe; 1(0).

Medicago sativa L. Alfalfa, Lucern. Perennial, or functionally annual, the stems 40-100 cm long or more, ascending to erect, finally sprawling, strigulose, stipules entire or toothed, 4-12 mm long, persistent; leaves short-petiolate, the leaflets elliptic to oblanceolate, 8-40 mm long, 2-15 mm

wide, apically few-toothed, pubescent; peduncles often surpassing the subtending leaves; racemes 6- to 25-flowered, 10-35 mm long or more; flowers 6-10 mm long, blue, lavender, pink, purple, or white; calyx campanulate to short-cylindric, the tube 1.5-2.5 mm long, the lance-subulate teeth 2-4 mm long; pods spirally coiled, unarmed, several-seeded. Introduced forage plant, escaping and persisting, now almost or quite cosmopolitan at moderate and lower elevations (Cache, Carbon, Garfield, Kane, Salt Lake, San Juan, Sanpete, Sevier, Tooele, Utah, Washington, and Weber cos.); introduced from Europe. This is one of the most important forage plants grown in the state; 35 (iv).

MELILOTUS L.

Plants annual or biennial herbs, caulescent, from a stout taproot; leaves alternate, pinnately trifoliolate, the leaflets dentate-serrate in the distal half or more; stipules herbaceous, distinct, subulate, entire or hastately lobed; flowers papilionaceous, borne in axillary, pedunculate racemes; bracts subulate; calyx 5-toothed; petals 5, white or yellow, the keel obtuse; stamens 10, diadelphous; ovary enfolded by the staminal sheath, the style subulate, not irritable; pods straight, ovoid, reticulately veined or cross-ribbed, unarmed, glabrous, 1- to 2-seeded, indehiscent.

- 1. Flowers 2-3 mm long, yellow; pedicels less than 1 mm long; plants known from Washington Co. *M. indicus*
- Flowers 3-7 mm long, white or yellow; pedicels 1-2 mm long; plants wide-spread 2
- 2(1). Flowers white; pods reticulately veined *M. albus*
- Flowers yellow; pods cross-ribbed *M. officinalis*

Melilotus albus Descr. ex Lam. White Sweet Clover. Annual or biennial, the stems commonly 50-150 cm tall or more, erect, strigulose; stipules entire or hastately lobed, mostly 5-10 mm long, persistent; leave short-petiolate, the leaflets obovate to elliptic or oblanceolate, 8-35 mm long, 1-15 mm wide, pubescent or glabrous; peduncles

commonly surpassing the subtending leaves; racemes 38- to 115-flowered, 28-125 cm long or more; flowers 4-5.5 mm long, white; calyx campanulate, the tube 1.2-1.8 mm long, the teeth 1-1.5 mm long, acuminate; pods 2.5-6 mm long, reticulately veined, 1- to 2-seeded. Introduced forage plant, now widely established in Beaver,

Box Elder, Cache, Garfield, Grand, Juab, Kane, Salt Lake, San Juan, Sanpete, Sevier, Tooele, Utah, Washington, and Wayne cos., and likely cosmopolitan; introduced from Europe. This plant is an excellent source of honey for domestic bees. Plants of sweet clover contain coumarin, and are responsible for production of bloat in livestock; 49 (xii).

Melilotus indicus (L.) All. India Sweet Clover. Annual or winter annual, the stems 20–80 cm tall, erect, glabrous or strigose; stipules lance-subulate, 4–6 mm long, persistent; leaves short-petiolate, the leaflets obovate to oblanceolate or elliptic, 7–30 mm long, 3–14 mm wide, glabrous; peduncles shorter to longer than the subtending leaves; racemes 21- to 43-flowered, 8–30 mm long; flowers 2–3 mm long, yellow (fading white); calyx campanulate, the tube 0.6–0.8 mm long, the teeth 0.5–0.7 mm long, triangular; pods 1.5–2 mm long, reticulately veined, 1-seeded. Adventive weedy plants of lower elevations in Washington Co.; introduced from Eurasia; 3 (0).

Melilotus officinalis (L.) Lam. Yellow Sweet Clover. (*Trifolium melilotus officinalis* L.). Annual, winter annual, or biennial, the stems 50–150 cm tall or more, erect, strigulose; stipules entire or with 1–3 basal teeth, 3–10 mm long, persistent; leaves shortly petiolate, the leaflets cuneate to elliptic or oblanceolate, 8–38 mm long, 3–16 mm wide, pubescent or glabrous; peduncles shorter to longer than the subtending leaves; racemes 20- to 65-flowered, 1.8–11 (14) cm long; flowers 4.5–6 (7) mm long, yellow, fading cream; calyx campanulate, the tube 1–1.8 mm long, the teeth 1–1.5 mm long, acuminate; pods 3–5 mm long, cross-ribbed, 1- to 2-seeded. Common ruderal weed of almost cosmopolitan distribution in Box Elder, Cache, Carbon, Daggett, Garfield, Grand, Kane, Millard, Piute, Salt Lake, San Juan, Sanpete, Sevier, Tooele, Utah, Wasatch, Washington, Wayne, and Weber cos., and likely anywhere; introduced from Europe. This plant has about the same attributes and shortcomings as does *M. albus*, with which it often occurs; 58 (xi).

ONOBRYCHIS Adans.

Perennial herbs, caulescent, from a caudex and taproot; leaves alternate, odd-pinnate; stipules adnate to the petiole base, the lowermost amplexicaul but not connate; flowers papilionaceous, in axillary racemes, each subtended by a bract; bracteoles 2; calyx 5-toothed; petals 5, red-purple to lavender or pink, the keel much longer than the wings, abruptly bow-shaped; stamens 10, essentially diadelphous; ovary enclosed in the staminal sheath, the style glabrous; loment reduced to 1 segment, this armed with prickles.

Onobrychis viciifolia Scop. Sainfoin, Holy Clover. [*Hedysarum onobrychis* L.; *O. onobrychis* (L.) Rydb.; *O. sativa* Lam.] Perennial, caulescent, 20–45 cm tall, from a branching, superficial caudex; stems ascending to erect; stipules 3–12 mm long, all more or less amplexicaul; leaves 3–12 mm long; leaflets 11–21 (27), 8–25 mm long, 2–7 mm wide, oblong to elliptic or oblanceolate, pilose mainly along veins beneath, glabrous above; peduncles 8–19 cm long; racemes 14- to 39 (50)-flowered, the flowers ascending-spreading at anthesis, the axis 4–15 cm long in fruit; bracts 2.5–4.5 mm long; pedicels 0.2–1.5 mm long; bracteoles 1; calyx 5.5–6.5 mm long, the tube 2.3–3 mm long, campanulate, the teeth 2.2–4 mm long, subulate; flowers 10–13 mm long, red-purple, lavender, or pink; loment sessile, ascending, armed with prickles. Introduced forage plant, escaping and persisting in Juab, Salt Lake, Sanpete, and Utah cos., and likely elsewhere; native to Europe. The genus is closely allied to *Hedysarum* (q.v.); 4 (i).

OXYTROPIS DC.

Perennial, caulescent, or acaulescent herbs, from a taproot and caudex; leaves alternate or basal, odd-pinnate; stipules adnate to the petiole base, often connate-sheathing, flowers papilionaceous, scapose or borne in axillary racemes, each subtended by a single bract; bracteoles 0 (rarely 2); calyx 5-toothed; petals 5, pink, pink-purple, or white, the keel shorter than the wings, the keel-tip produced into a por-

rect beak; stamens 10, diadelphous; ovary enfolded in the staminal sheath, the style glabrous; pods sessile or stipitate, straight, erect, ascending, or spreading-declined, 1-loculed, 2-loculed, or partially 2-loculed by intrusion of the ventral (upper) suture, dehiscent apically or throughout.

REFERENCES

BARNEBY, R. C. 1952. A revision of the North American species of *Oxytropis* DC. Proc. Calif. Acad. Sci. IV. 27:177-312.

1. Plants shortly caulescent; stipules only somewhat adnate to the petioles; flowers 5-9 mm long; pods spreading-declined *O. deflexa*
- Plants acaulescent, scapose; stipules adnate to petioles through half their length or more; flowers commonly more than 9 mm long; pods erect or ascending 2
- 2(1). Bracts, calyx teeth, pods, and sometimes other plant parts glandular-viscid *O. viscida*
- Bracts, calyx teeth, pods, and other plant parts pilose to villosulous, but not at all glandular-viscid 3
- 3(2). Racemes 1- to 5-flowered, subcapitate 4
- Racemes 6- to many-flowered, the axis elongate, only rarely subcapitate 7
- 4(3). Calyx swollen at full anthesis, becoming inflated and finally enclosing the pod; pods rarely longer than 10 mm; plants of Daggett Co. *O. multiceps*
- Calyx campanulate, not turgid, not becoming inflated or enclosing the fruit, at length rupturing along one side; pods often over 10 mm long 5
- 5(4). Pods oblong-ellipsoid, not inflated, leathery in texture; flowers 1-4; plants of mountain summits in north central to southern Utah *O. parryi*
- Pods ovoid, inflated, papery in texture; flower number various; plants of various distribution 6
- 6(5). Flowers 6-12 mm long; leaflets 7-17; plants of limestone, gravel, and basalt in southern Utah *O. oreophila*
- Flowers (11) 14-17 mm long; leaflets 3-7; plants of shale and limestone in Uintah, Emery, and Garfield cos. *O. jonesii*
- 7(6). Plants dwarf, seldom over 10 cm tall; flowers 6-12 mm long; growing on limestone, gravel, and basalt in southern Utah *O. oreophila*
- Plants mainly over 10 cm tall; flowers 14-27 mm long; growing on various substrates and with distribution various but seldom as above 8
- 8(7). Petals bright pink-purple 9
- Petals white or ochroleucous to yellowish 10
- 9(8). Pubescence of basifixed hairs; calyx somewhat swollen and accrescent; plants of Daggett Co. *O. besseyi*
- Pubescence of malpighian hairs; calyx not swollen or enlarging; plants of wide distribution *O. lambertii*
- 10(8). Wing petals dilated apically, at least 5 mm wide; plants of broad distribution *O. sericea*
- Wing petals not especially dilated, less than 5 mm wide, plants known from the north slope of the Uinta Mts. *O. campestris*

Oxytropis besseyi (Rydb.) Blankinship. Bessey locoweed. [*Aragallus besseyi* Rydb.] Caespitose, acaulescent, 8–28 cm tall; pubescence basifixed, silky-pilose to subtomentose; stipules pilose-tomentose; leaves 6–20 cm long; leaflets 11–13 (25), 6–25 mm long, 2–6 mm wide, lanceolate to lance-oblong or elliptic, silky-pilose; scapes 6–19 cm long, subtomentose; racemes 8- to 22-flowered, the flowers spreading-ascending at maturity, the axis 2.5–8 cm long in fruit; bracts silky-pilose; flowers 18–25 mm long, brilliant pink-purple; calyx 10–13 mm long, the tube swollen at anthesis, 7.5–9.5 mm long, the teeth 2.5–4 mm long, lance subulate; pods sessile or nearly so, strongly inflated, the body ovoid, 5–8 mm thick, semi-bilocular, densely villous. Pinyon-juniper community at 1830 to 2130 m in Daggett Co.; Montana, Idaho, Wyoming, and Colorado. Our material is assignable to *var. obnapiformis* (C. L. Porter) Welsh comb. nov. based on *Oxytropis obnapiformis* C. L. Porter, Madroño 9:133. 1947. Maintenance of *O. obnapiformis* at specific rank was discussed by Barneby (1952), who noted that the features used as diagnostic ones “are not strong characters.” That information along with the apparent intermediacy of Utah specimens with those of *var. fallax* Barneby, from nearby in Wyoming, dictates that the reduction of *O. obnapiformis* is necessary. In specimens from Utah, the leaflet number is fewer than in more typical plants from northwestern Colorado, but the pubescence and pod features seem to substantiate the recognition of the taxon at varietal rank; 5 (0).

Oxytropis campestris (L.) DC. Yellow Locoweed. [*Astragalus campestris* L.].

Caespitose, acaulescent, 4–18 cm tall; pubescence basifixed, mainly pilose; stipules glabrous or sparingly pilose; leaves 1.5–12 cm long; leaflets 7–17, 3–23 mm long, 1–6 mm wide, oblong to lanceolate or obovate; scapes 2.5–15 cm long, pilose to glabrate; flowers 14–20 mm long, ochroleucous; calyx 7–10 mm long, the tube cylindric, the teeth 1.5–3 mm long, triangular-subulate, pods 8–18 mm long, erect, sessile or subsessile, pilose, partially bilocular by intrusion of the ventral suture. Meadows and open woods at 2270 to 2600 m in Summit Co. (Goodmans Ranch, Bear River, E. & L. Payson 4868 POM); Oregon, Washington, Idaho, Montana, and Colorado. The range as given is for our materials only, which belong to *var. cusickii* (Greenm.) Barneby (*O. cusickii* Greenm.). The species proper is circum-boreal; 1 (0).

Oxytropis deflexa (Pallas) DC. Stemmed Oxytrope. Shortly caulescent to subacaulescent, (5) 7–48 cm tall; pubescence basifixed, villous-pilose; leaves 2–20 cm long; leaflets 23–41, 3–24 mm long, 1–7 mm wide, lance-oblong to lanceolate, pilose on both surfaces, quite sessile; peduncles 3.5–32 cm long, villous-pilose; racemes 3- to 25-flowered, the flowers ascending to declined at anthesis, the axis 3.5–10 cm long in fruit; bracts pilose; flowers 5–10.5 mm long, whitish, lilac, or blue-purple; calyx 4–8 mm long, the tube 2–3.5 (4.2) mm long, campanulate, the teeth 1.5–5 mm long, lance-subulate; pods spreading-declined, subsessile to shortly stipitate, the body oblong to ellipsoid, 8–18 mm long, 3–4.5 mm wide, subunilocular, pilosulous. Two rather distinctive varieties occur in Utah.

1. Plants subacaulescent; flowers 9–10.5 mm long, blue-purple; racemes 15–22 mm broad at anthesis; of high elevations in Uinta Mts. *O. deflexa* var. *deflexa*
- Plants commonly short caulescent; flowers 5–9 mm long, whitish, lilac, or blue-purple; racemes commonly less than 17 mm wide at anthesis; of moderate elevations, widespread *O. deflexa* var. *sericea*

Var. *deflexa*. [*Astragalus deflexus* Pallas]. Meadows at 2750 to 3350 m in Duchesne and Summit (Goodrich 824, BRY) cos; Colo-

rado and north to Yukon; Asia. The North American material here assigned to *var. deflexa* might well represent a distinct taxon,

worthy of recognition at varietal level; 2 (0).

Var. *sericea* Torr. & Gray. Moist meadows, streambanks, and gravel bars in aspen, mixed conifer, and sagebrush communities at 2430 to 3050 m in Emery, Garfield, Grand, Iron, Summit, Uintah (?), and Wayne cos; Alaska and Yukon south to California, New Mexico, and North Dakota; 21 (vi).

***Oxytropis jonesii* Barneby.** Jones Oxytrope. Acaulescent, densely pulvinate-caespitose; pubescence basifixed, villous-pilose; leaves 0.7–3 cm long; leaflets 1–7, 2–11 mm long, 1–3.5 mm wide, lanceolate to lance-oblong, pilose to strigose on both surfaces, quite sessile; scapes 0–3.5 cm long, villous-pilose; racemes 1- to 5-flowered, the flowers ascending at anthesis, the axis not elongating in fruit; bracts pilose; flowers (11) 14–16.5 mm long, pink-purple; calyx 7.5–9.5 mm long, the tube shortly cylindric, 4.5–7 mm long, the teeth 1.5–3 mm long, triangular to subulate; pods sessile or subsessile, erect, bladderly-inflated, 14–25 mm long 8–13 mm wide (when pressed), semibilocular, villous-pilose. Ponderosa pine, western bristlecone pine, and mixed desert shrub communities, on Flagstaff Limestone, Pink Limestone member of Wasatch Formation, and on Green River Shale Formation, at 1930 to 2430 m in Emery, Garfield (type from Red Canyon), and Uintah cos.; endemic. The Jones oxytrope is closely allied to *O. oreophila* with which it is sympatric at the type locality; 16 (v).

***Oxytropis lambertii* Pursh.** Lambert Locoweed. [*O. lambertii* var. *bigelovii* Gray; *Aragallus bigelovii* (Gray) Greene; *Astragalus lambertii* var. *bigelovii* (Gray) Tidestr.; *Aragallus metcalfei* Greene; *Aragallus knowltonii* Greene; *Aragallus patens* Rydb.; *O. patens* (Rydb.) A. Nels.; *O. bilocularis* A. Nels.]. Caespitose, acaulescent, (10) 14–50 cm tall; pubescence malpighian, strigose; stipules pilose; leaves 3–24 cm long; leaflets 7–13, 7–45 mm long, 2–8 mm wide, lanceolate to oblong or linear; scapes 4–28 cm long, strigose; racemes 8- to 40-flowered, the flowers ascending at anthesis, the axis 3–23 cm long in fruit; bracts strigose; flowers 17–25 mm long, pink-purple; calyx

6.5–10 mm long, the cylindric tube 4.5–7.5 mm long, the teeth 1.5–4.5 mm long, subulate; pods sessile or shortly stipitate, erect or ascending at maturity, cylindroid to lance-acuminate in outline, the body 15–27 mm long, 2.5–6 mm thick, bilocular, strigose to strigulose. Mixed desert shrub, pinyon-juniper, sagebrush, and grass communities at 1230 to 2730 m in Carbon, Duchesne, Emery, Garfield, Kane, San Juan, Sanpete, Sevier, Wasatch, and Wayne cos.; the species from Saskatchewan and Manitoba south to Arizona, New Mexico, and Texas. Our material belongs to var. *bigelovii* A. Gray, which occurs from Wyoming south to Arizona and New Mexico. In other places where *O. lambertii* contacts *O. sericea*, hybrid swarms of great variability and beauty occur. No such extensive hybrid populations are known for Utah, possibly because the points of contact between these species are few or non-existent; 51 (xii).

***Oxytropis multiceps* Torr. & Gray.** Rocky Mountain Oxytrope. [*Spiesia multiceps* (Torr. & Gray) Kuntze; *Aragallus multiceps* (Torr. & Gray) Heller; *Astragalus bisontum* Tidestr.; *O. multiceps* var. *minor* A. Gray; *Aragallus multiceps* var. *minor* (A. Gray) A. Nels.; *Aragallus minor* (A. Gray) Cockerell ex Daniels; *O. minor* (A. Gray) Cockerell; *Astragalus bisontum* var. *minor* (A. Gray) Tidestr.]. Caespitose, acaulescent, pulvinate; pubescence basifixed, silky-pilose; stipules amplexicaul but distinct, silky-pilose; leaves 1–5 cm long; leaflets 5–9, 3–13 mm long, 1–4 mm wide, lanceolate to elliptic, oblong, or oblanceolate, silky-pilose; scape 1–4 cm long, long-villous; racemes 1- to 4-flowered, the flowers ascending-spreading at anthesis, the axis to 0.5 cm long in fruit; bracts thinly pilose; flowers 17–24 mm long, bright pink-purple; calyx 7–13 (20) mm long, the tube swollen at anthesis, becoming bladderly-inflated and investing the fruit at maturity, 5.5–10 mm long (8–18 mm in fruit), the teeth 2–3 mm long, triangular-subulate; pods included within the swollen calyx, stipitate, the stipe 0.5–1.5 mm long, the ovoid-ellipsoid body 6–10 mm long, 3–5 mm wide, subunilocular, short-villous. Pinyon-juniper and ponderosa pine commu-

nities at 1830 to 2270 m in Daggett Co.; Wyoming, Colorado, and Nebraska; 2 (0).

Oxytropis oreophila A. Gray. Mountain Oxytrope. Caespitose, acaulescent, often densely pulvinate, 1-14 (23) cm tall; pubescence basifixed, silky-pilose; stipules silky-pilose; leaves 0.5-8.5 cm long; leaflets (5) 7-17, 1-15 mm long, 0.5-4 mm wide, lanceolate, elliptic, oval, or ovate, pilose; scapes 0-12 (21) cm long, pilose to hirsute; racemes (1) 2- to 12-flowered, the flowers ascending-spreading at anthesis, the axis to

1 cm long in fruit; bracts pilose; flowers 6-12.5 mm long, pink to pink-purple or white; calyx 4.5-8 mm long, the tube 3.2-5.5 mm long, campanulate to short-cylindric, the teeth 1.3-2.5 mm long, subulate; pods sessile, bladdery-inflated, (7) 9-17 mm long, 5-14 mm wide (when pressed), subunilocular, hirsutulous to vilous. Two more or less distinctive, but only arbitrarily separable varieties are present in Utah.

- 1. Plants densely pulvinate-caespitose; leaves 0.5-2 cm long, the leaflets mostly 2-5 mm long; pods 10 mm long or less, and less than 6 mm wide; flowers 9.5 mm long or less *O. oreophila* var. *juniperina*
- Plants densely to loosely pulvinate-caespitose; leaves often more than 2 cm long, the leaflets commonly more than 5 mm long; pods 9-17 mm long, more than 6 mm wide; flowers commonly 10-12.5 mm long.
..... *O. oreophila* var. *oreophila*

Var. *juniperina* Welsh var. nov. *Oxytropis oreophila* var. *oreophila* aemulans sed differt dense caespitosi-pulvinatis, foliis brevissimis, leguminibus brevissimis et angustis, et floribus brevissimis. Holotype: Utah, Wayne Co., ca 1 mile east of Bicknell, at 2200 m on Carmel formation, in pinyon-juniper woodland, Welsh & Moore 13828, 30 June 1976 (BRY). Paratypes: Utah, Wayne Co., do, Welsh & Moore 13831, 30 June 1976 (BRY); do, Atwood 1863, 18 June 1969 (BRY). Material of the *Juniperina* phase has long been recognized. Gray (Proc. Amer. Acad. 20:3, 1884) alluded to a specimen by Ward (574 GH, US), from Rabbit Valley (Loa-Bicknell vicinity), Utah, as a possible variety of *O. oreophila* or a related species "with flowers immersed in tufts of foliage." It is a xeric phase of *O. oreophila*, which passes by degree in to var. *oreophila*. Other xeric phases fail to demonstrate the morphological features of these striking plants, and the trend seems worth recognition from a taxonomic standpoint; 5 (iii).

Var. *oreophila*. [*Spiesia oreophila* (Gray) Kuntze; *Aragallus oreophilus* (Gray) A. Nels.; *Astragalus oreophilus* (Gray) Tidestr.; *Astragalus munzii* Wheeler.] Alpine tundra, ridge tops, meadows, spruce-fir, ponderosa pine, pinyon-juniper, and less commonly in mixed desert shrub communities, on lime-

stone, volcanic gravels, beach gravels, and sands, at 1700 to 3350 m in Beaver, Garfield, Iron, Kane, Piute, Sanpete, and Wayne cos.; California, Nevada, Arizona, and New Mexico; 67 (xiv).

Oxytropis parryi A. Gray. Parry Oxytrope. [*Spiesia parryi* (A. Gray) Kuntze; *Aragallus parryi* (A. Gray) Greene; *Astragalus parryanus* Tidestr., not *A. parryi* A. Gray.] Caespitose, acaulescent, 2-11 cm tall; pubescence basifixed, silky-pilose; leaves 1.5-7 cm long; leaflet 7-17, 2-9 (12) mm long, 0.8-3 mm wide, oblong to elliptic or lanceolate, pilose; scapes 1.2-8 (10) cm long, pilose; racemes 1- to 3 (4) -flowered, the flowers erect or ascending, the axis 0.5-1 cm long in fruit; bracts pilose; flowers 7.5-12 mm long, pink-purple; calyx 5-8 mm long, the tube 3-5.5 mm long, campanulate to short-cylindric, the teeth 1.5-2.5 mm long, triangular-subulate; pods erect, sessile, oblong to lance-ovoid, 13-22 mm long, 4-8 mm thick, bilocular or nearly so, pilosulous. Alpine tundra, ridge tops, and meadows at 2700 to 3770 m in Beaver, Carbon, Garfield, Grand, Juab, Piute, San Juan, and Wasatch cos.; Idaho, Wyoming, California, Colorado, and New Mexico. The Parry oxytrope is difficult to distinguish in flower from *O. oreophila*, especially from specimens of that species with fewer than five

flowers. The fruit is definitive; 11 (v).

***Oxytropis sericea* Nutt. in Torr. & Gray.** Silky or White Locoweed. [*O. lambertii* var. *sericea* (Nutt.) A. Gray; *Spiesia lambertii* var. *sericea* (Nutt.) Rydb.; *Aragallus lambertii* var. *sericeus* (Nutt.) A. Nels.; *Aragallus majusculus* Greene, type from the Mt. Ellen Henry Mts.] Caespitose, acaulescent, 13–32 cm tall, pubescence basifixed, silky-pilose; stipules pilose to submentose; leaves 3.5–21 cm long; leaflets 9–23, 4–32 (40) mm long, 1.5–10 mm wide, lanceolate to oblong elliptic, or ovate, pilose; scapes 7–26 cm long, pilose; racemes 6- to 27-flowered, the flowers ascending to spreading, the axis 1.5–12 cm long in fruit; bracts pilose; flowers 15–26 mm long, white or tinged with purple; calyx 8–12 mm long, the tube cylindric, the teeth triangular to subulate; pods erect, sessile, the body subcylindric to ovoid-oblong, 10–25 mm long, 4–7.5 mm thick, bilocular or nearly so, strigose or pilosulous. Sagebrush, pinyon-juniper, and grassland (rarely mixed desert shrub) communities at 1670 to 3350 m in Box Elder, Carbon, Daggett, Duchesne, Emery, Garfield, Kane, Piute, Summit, and Wayne cos.; the species from the Yukon southward to Nevada, New Mexico, and Oklahoma. Our materials belong to var. *sericea*, which occurs from Montana, Idaho, and South Dakota, south to Nevada, New Mexico, and Oklahoma; 38 (vii).

***Oxytropis viscida* Nutt.** Viscid Locoweed. [*O. campestris* var. *viscida* (Nutt.) S. Wats.; *Spiesia viscida* (Nutt.) Tidestr.] Caespitose, acaulescent, 4–18 cm tall; pubescence basifixed, spreading-hairy; stipules glabrous dorsally, commonly prominently glandular; leaves 2–17 cm long; leaflets 19–39 or more, 1.5–20 mm long, 1–5 mm wide, oblong to lanceolate or elliptic, glabrate to glabrous on both sides, sometimes glandular; scapes 2–12.5 cm long, spreading-hairy; racemes 3- to 20-flowered, the flowers spreading-ascending, the axis 2–7 cm long in fruit; bracts glandular; flowers 11–19 mm long, whitish, lilac, or pink-purple; calyx 5–11 mm long, the shortly cylindric tube 4–7 mm long, the teeth 1.5–3.5 mm long, triangular-subulate, commonly glandular; pods erect, sessile, ovoid to subcylindric,

8–20 mm long, 4–5 mm thick, bilocular, glandular. Montane meadows, shrublands, and open woods at 2430 to 3050 m in Emery, Salt Lake, Sanpete, Sevier, Utah, and Wayne cos.; Alaska east to Gaspé and south to California, Nevada, Colorado, and Minnesota. Our material belongs to var. *viscida*. This is a portion of a circumboreal complex with great variation. Utah materials demonstrate two of the extreme phases of that variety. Naming of the phases within the species would lead to an endless entanglement. Thus, the whitish flowered plants from Emery, Sanpete, and Sevier cos., are considered as a minor element in this evidently polygenetic and certainly polymorphic series; 14 (iv).

PARRYELLA Torr. & Gray ex A. Gray

Unarmed shrubs; leaves alternate, pinnate, with numerous leaflets, glandular-dotted; stipules subulate, caducous; peduncles opposite the leaves; flowers in loose spicate racemes or panicles; calyx turbinate-campulate, 10-ribbed near the base, 5-lobed; petals lacking; stamens 10, the filaments distinct, inserted on the hypanthium; pods 1-seeded (2-ovuled), indehiscent, obliquely obovoid, glandular-dotted, exserted from the calyx.

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***Parryella filifolia* Torr. & Gray ex A. Gray.** Narrow-leaf Dunebroom. Shrubs to 15 cm tall or more, often partially buried in sand, the branchlets strigose and with mammiform glandular protuberances; stipules 1–2 mm long, chestnut-brown, fragile; leaves 3.5–13 cm long; leaflets 8–40, 1–21 mm long, linear, all involute, strigose to glabrate and glandular on the visible surface; peduncles 0–1 cm long; racemes 4–10 cm long, the main ones often branched near the base, forming panicles, 35- to 90-flowered, the axis not much elongating in fruit; bracts reduced to gland-tipped ves-

tiges; calyx 2.6–3.1 mm long, 10-ribbed near the base, the tube opaque, the teeth 0.2–0.5 mm long, ciliate; flowers 5–6.5 mm long in anthesis, the stamens long-exserted; pods short-stipitate, the body 5–6.5 mm long, 2.5–3 mm wide, the pilose style base persistent, glabrous, glandular-punctate. Stabilized dune sands at 1470 to 1570 m astride the Grand-San Juan co. line, and previously known from along the San Juan River near the present upper reaches of Lake Powell; New Mexico and Arizona; 5 (iv).

PETERIA A. Gray

Perennial, caulescent, from a subterranean caudex arising from deep-seated tuberous roots; leaves alternate, odd-pinnate; stipules only slightly adnate to the petiole base, spinescent; flowers papilionaceous, borne in terminal racemes, each subtended by a bract, or the lowermost flower sometimes axillary; bracteoles 0; calyx 5-toothed; petals 5, whitish to ochroleucous, rarely pinkish; stamens 10, diadelphous; style hairy at apex; pods narrowly oblong, straight, few- to several-seeded, laterally compressed, dehiscent, the valves coiling upon dehiscence.

Peteria thompsonae S. Wats. Thompson *Peteria*. [*P. nevadensis* Tidestr.]. Perennial, 11–48 cm tall; pubescence basifixed, of flattened appressed hairs; stems erect to sprawling; stipular spines 1.8–6.5 mm long; leaves 4–18 cm long; leaflets 9–27, 6–17 mm long, 3–11 mm wide, elliptic to ovate, oblong to oval, strigose on both sides or glabrate above; peduncles 0–4 cm long; racemes 5- to 44-flowered, the flowers ascending at anthesis, the axis 6–18 cm long in fruit; bracts 5–9 mm long, stipitate-glandular; pedicels 1–5 mm long, strigulose and stipitate-glandular; calyx 11–16.2 mm long, the tube 6.5–8 mm long, short-cylindric, stipitate-glandular, the teeth 3.8–9 mm long, lance-subulate; flowers 18–22 mm long, whitish to ochroleucous, rarely pinkish; pods descending, stipitate, the stipe to 11 mm long, the body 48–55 (70) mm long, 5–7 mm wide, glabrous, more or less constricted between the seeds. Pinyon-juniper and mixed desert shrub communities at 1230 to 1870 m in Emery, Grand, Juab, Kane, San

Juan, and Washington co.; Arizona, Nevada, and Idaho. The type specimen was collected by Mrs. Ellen Thompson, sister of John Wesley Powell, at Kanab, where she lived in 1872. This is a singular and striking plant; 16 (v).

PHASEOLUS L.

Annual herbs, from a taproot; leaves alternate, pinnately trifoliolate; stipules herbaceous, distinct; flowers papilionaceous, axillary or in axillary racemes, each subtended by a bract; bracteoles 2, attached at base of calyx; calyx 5-toothed; petals 5, pink to purplish or white; stamens 10, diadelphous; ovary few- to several-ovuled, the style twisted or coiled in the keel, bearded towards the apex, the stigma oblique; pods linear to oblong, laterally flattened to subterete, the valves coiling upon dehiscence.

Phaseolus vulgaris L. Kidney Bean. Annual, 30–200 cm tall or more, clump-forming or twining and vine-like; pubescence basifixed, villosulous or finally glabrate; petioles 4–20 cm long; leaflets 3, stipelate, commonly 40–100 mm long and 20–80 mm wide, ovate to lanceolate, pilosulous to villosulous on both sides, mainly along the veins; peduncles 0–2 cm long; racemes few-flowered; flowers 12–16 mm long; bracteoles ovate-lanceolate, prominently veined; pods slender, subterete to flattened, most 6–15 cm long. This is the table bean of commerce. It is cultivated widely, escaping commonly, but hardly persisting; native of the New World (?). Additional species are present in the cultivated flora of the state, but the extent is unknown, and they are here excluded. Among them are the scarlet runner bean (*P. coccineus* L.) and the lima bean (*P. limensis* Macf.); 2 (i).

PISUM L.

Plants herbaceous, annual, from a taproot; stipules prominent, larger than the leaflets, semi-sagittate to ovate or reniform; stems clambering, not winged; leaves alternate, even-pinnate, the terminal extension of the rachis forming prehensile tendrils; racemes axillary, pedunculate, 1- to few-

flowered; stamens 10, diadelphous; style laterally compressed, bearded along the ventral edge; pods 1-loculed, oblong in outline, several-seeded, the valves coiling upon dehiscence.

Pisum sativum L. Garden Pea. Plants 20-200 cm long or more, sprawling or clambering, the stems merely angled, glabrous; stipules foliaceous, larger than the leaflets; leaflets 4-6, elliptic to ovate to oblong-lanceolate, 9-60 mm long, 6-40 mm wide, glabrous; tendrils with 1-3 pairs of lateral branches, prehensile; flowers 1-3 per raceme, white, red, or bicolored, 18-30 mm long; calyx 12-18 mm long, the teeth longer than the tube; pods commonly 4-10 cm long, glabrous. Cultivated pea of commerce, widely grown, escaping but not persisting; introduced from Eurasia. Several horticultural forms are grown, mostly with white flowers. 2 (i).

- 1. Leaflets 5-8 pairs, mostly less than 10 mm long; pods coiled spirally into a woody cylinder *P. pubescens*
- Leaflets 10-18 pairs or more, often exceeding 10 mm long; pods narrowly oblong, straight or nearly so *P. glandulosa*

Prosopis glandulosa Torr. Mesquite. [*P. juliflora* authors, not (Sw.) DC.; *P. chilensis* authors, not (Mol.) Stuntz]. Armed shrubs or broad-crowned trees, commonly 3-5 m tall; leaves petiolate, the rachis produced as a spine; pinnae 2; leaflets 7-17 pairs, oblong to narrowly oblong, 7-38 mm long, 1-4 mm wide, glabrous on both sides, sometimes ciliate; spines nodal but not stipular, single or paired, 3-35 mm long or more; stipules inconspicuous, subulate; flowers in yellowish to greenish spikes, clustered from spur branches, ascending to declined; ovary pilose; pods stipitate, the stipe 5-8 mm long, the body narrowly oblong to linear, often curved, subterete to somewhat flattened, mostly 100 to 200 mm long, a bony endocarp around each seed. Terraces and bars at 670 to 1170 m in Washington Co.; the species from California, Nevada, Arizona, New Mexico, Kansas, Oklahoma, Texas, and southward. Our specimens belong to var. *torreyana* (Benson) M. C. Johnston (*P. juliflora* var. *torreyana* Benson), with distribu-

PROSOPIS L.

Armed shrubs or small trees; leaves alternate, bipinnate, with an obscure gland between the lower pair of pinnae; leaflets several to numerous; stipules small, or modified as spines; flowers perfect, borne in spikelike racemes, yellowish to ochroleucous; calyx 5-toothed; corolla regular, the 5 petals distinct or nearly so; stamens 10, distinct, exerted, the anthers terminally glandular; ovary pubescent, sessile or stipitate, the stigma concave; pods indehiscent, narrowly oblong and more or less constricted between the seeds or spirally coiled.

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tion from California, Arizona, New Mexico, and Texas southward. In the herbarium of the University of Utah (UT) there is a specimen of mesquite labeled as collected in a vacant lot in North Salt Lake; whether accidental or cultivated, is not known; 17 (i).

Prosopis pubescens Benth. Screwbean. [*P. odorata* Torr. & Frem. in Frem.; *Strombocarpa pubescens* (Benth.) A. Gray; *S. odorata* A. Gray.] Armed shrubs or small trees with slender branches, commonly 2.5-3.5 m tall; leaves shortly petiolate, the rachis produced as a spine; pinnae 2 (rarely 4); leaflets 5-8 pairs, elliptic to oblong, puberulent to glabrate; spines paired at nodes, apparently stipular, mostly 5-25 mm long; flowers in clusters or solitary, yellowish spikes; ovary villous; pods tightly coiled into a woody cylinder, 30-50 mm long, 4-6 mm thick. Benchlands, slopes, and terraces along drainages at 730 to 900 m in Washington Co.; California, Nevada, Arizona, New Mexico, Texas, and Mexico; 9 (i).

PSORALEA L.

REFERENCES

Perennial herbs, unarmed, from rhizomes or tuberous roots; leaves alternate, palmately compound, the leaflets 3-5, glandular-dotted; stipules triangular to subulate; flowers in axillary racemes or spike-like racemes; calyx subcylindric to campanulate, 5-lobed; corolla papilionaceous; stamens 10, diadelphous (rarely all connate); petals bluish or purplish to lavender or white; pods 1-seeded, indehiscent or irregularly so, included in the calyx or slightly exceeding it.

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1. Plants strongly caulescent, commonly 25-100 cm tall, arising from rhizomes; leaves mainly 3-foliolate (except in *P. tenuiflora*); leaflets narrowly obovate to oblanceolate or linear; bracts of inflorescence inconspicuous 2
- Plants subacaulescent to short-caulescent, mostly shorter than 25 cm, arising from tuberous roots or thickened rhizomes; leaves mainly 5-foliolate (except in *P. pariensis*); leaflets obovate to sub-orbicular; bracts of inflorescence conspicuous 4
- 2(1). Peduncles 15-40 cm long or more; leaves few, mostly deciduous by anthesis, the leaflets sharply acuminate; plants of southeastern Utah *P. juncea*
- Peduncles mainly shorter than 15 cm; leaves numerous, persisting through the season, the leaflets obtuse to rounded or cuspidate; distribution various 3
- 3(2). Plants commonly 40-100 cm tall, at least some leaves 4- to 5-foliolate; flowers mainly indigo; plants of western Kane, Washington, and Iron cos. *P. tenuiflora*
- Plants often less than 40 cm tall, all leaves commonly 3-foliolate; flowers white to purple; plants widespread in Utah *P. lanceolata*
- 4(1). Plants definitely caulescent, or if acaulescent (as occasionally in *P. epipsila*), then leaflets glabrous or glabrate above 5
- Plants acaulescent to short-caulescent; leaflets definitely pubescent above 6
- 5(4). Leaflets conspicuously bicolored, cinerous beneath, bright green and glabrous to glabrate above (except along some veins); plants known only from southern Kane Co. and adjacent Arizona *P. epipsila*
- Leaflets dull-green beneath, green above, pubescent as above; plants of central eastern Utah *P. aromatica*
- 6(4). Leaflets commonly 3, strongly white strigose along the veins above; plants of the Paunsagaunt and Paria regions *P. pariensis*
- Leaflets commonly 5, uniformly strigose above, or glabrous, or thinly strigose along the veins; plants of various distribution 7
- 7(6). Petioles and peduncles appressed or ascending pubescent; plants rather widespread in eastern Utah. *P. megalantha*
- Petioles and peduncles retrorsely hairy; plants of Washington Co. *P. mephitica*

Psoralea aromatica Payson. Paradox Breadroot. [*P. rafaensis* M. E. Jones, type from LaSal Mts.; *P. rafaensis* var. *magna* M. E. Jones, type from the San Rafael Swell.] Caulescent, 8–15 (20) cm tall, from slender subterranean caudex branches arising from deep-seated tuberous roots; stems with 2–4 (5) elongated internodes, strigose to strigulose; leaves mainly 5-foliolate; petioles 1.2–8 cm long, pubescent like the stems; leaflets 6–26 mm long, 3–16 mm wide, cuneate-obovate, gray-green, strigulose, and punctate beneath, yellow-green, punctate, and strigose overall or only along the veins above; stipules scarious, 2–9 mm long; peduncles 0.2–0.5 cm long; racemes 3- to 7-flowered, 1–2 cm long; pedicels 1–2.5 mm long; bracts lanceolate, 4–7 mm long; flowers 10–13 mm long, the banner, wings, and keel more or less suffused with purple; calyx 10–11 mm long, the tube 3–4 mm long, strongly gibbous, the lower tooth 5–7 mm long, about twice as broad as the lower lateral ones; pods to 15 mm long. Pinyon-juniper woodland and mixed desert shrub communities at about 1530 m in Emery and Grand cos.; Paradox Basin, Colorado, a middle Navajo Basin endemic; 8 (2).

Psoralea epipsila Barneby. Kane Breadroot. Subcaulescent or short-caulescent, 3.5–10.5 cm tall, from slender subterranean caudex branches arising from deep-seated tuberous roots; stems with 2 or 3 elongated internodes, strigose to ascending hairy; leaves mainly 5-foliolate; petioles 0.8–5 cm long, pubescent like the stems; leaflets 5, 8–25 mm long, 3–15 mm wide, obovate, grayish, strigulose, and punctate beneath, bright yellow-green, punctate and glabrous to thinly strigose above (especially along the veins); peduncles to 5 cm long; racemes 2–4 cm long; pedicels about 3 mm long; bracts broadly lanceolate, 10–13 mm long; flowers 11–14 mm long, the banner, wings, and keel pale violet; calyx 11–14 mm long, the tube 5–6 mm long, strongly gibbous, the lower tooth about 8 mm long, the upper ones shorter and narrower; pods 1-seeded. Pinyon-juniper woodland at about 1670 m on Chinle and Moenkopi formations in Kane Co., and in adjacent Arizona; 2 (0). The Kane breadroot is still imperfectly un-

derstood, even though the first collection was taken by M. E. Jones in 1890. Many more collections are necessary before adequate descriptions and relationships can be drawn. This is a Mohave Strip endemic; 2 (0).

Psoralea juncea Eastw. Rush Scurfpea. [*Psoralidium junceum* (Eastw.) Rydb.] Caulescent, 48–90 cm tall, from a rhizome; stems with 5 or more elongated internodes, strigose; leaves commonly 3-foliolate, often deciduous by anthesis; petioles 1.4–7 cm long, pubescent like the stems; leaflets 3, 19–44 mm long, 3–7 mm wide, oblanceolate to elliptic, acuminate apically, strigose and glandular on both surfaces, greenish; stipules acuminate, strigose; peduncles (8) 11–48 cm long; racemes 7- to 20-flowered, 5–11 cm long; bracts lance-acuminate, glabrous dorsally, 1.5–2.5 mm long, deciduous; flowers 4.2–5.8 mm long, the petals indigo; calyx 2.7–3.4 mm long, the tube 1.3–2.5 mm long, campanulate, not especially gibbous, the lower tooth 0.7–1.4 mm long, longer than the others; pods 1-seeded, densely silky-villous. Stabilized dunes and other sandy sites at 1200 to 1370 m in Garfield, Kane, and San Juan cos.; Coconino Co., Arizona; a Glen Canyon-San Juan endemic; 21 (iv).

Psoralea lanceolata Pursh. Dune Scurfpea. Caulescent, 15–68 cm tall, from a rhizome, clump-forming; stems with 5 or more elongated internodes, glabrous or strigose; leaves commonly 3-foliolate, persistent at flowering; petioles 0.8–3 cm long, strigose to glabrate; leaflets 3, 14–50 mm long, 0.5–9 mm wide, oblanceolate below becoming linear upwards, obtuse to acute or cuspidate, sparingly strigose on both sides or glabrous above, yellow-green; stipules lance-attenuate, 3–16 mm long; peduncles 3.3–24 cm long; racemes 5- to 41-flowered, 1.2–17 cm long; bracts ovate to elliptic or lanceolate, glabrous dorsally, 1.3–2.8 mm long, persistent, flowers 4.8–6.3 mm long, blue, white, or bicolored; calyx 1.6–2.8 mm long, the tube 1.3–2 mm long, campanulate, not especially gibbous, the lower tooth 0.2–0.8 mm long, not much larger than the others; pods 1-seeded, conspicuously glandular. Three rather distinctive but apparently intergrading varieties are present in Utah.

- 1. Racemes lax, 25-170 mm long at anthesis, the flower nodes widely separated, often with 2 or 3 flowers per node; blue flower color predominating; plants of southeastern Utah *P. lanceolata* var. *stenophylla*
- Racemes compact to moderately lax, 12-55 mm long at anthesis, the flower nodes seldom widely separated or mainly with more than 3 flowers per node; blue and white flowers variably abundant; plants of various distribution 2
- 2(1). Racemes (12) 27-55 mm long, with (17) 27-41 flowers; plants of the Great Basin..... *P. lanceolata* var. *stenostachys*
- Racemes 10-25 (28) mm long, with 5-24 flowers; plants of the Colorado Basin *P. lanceolata* var. *lanceolata*

Var. lanceolata. Plains Scurfpea. [*Psoralidium lanceolatum* (Pursh) Rydb.; *P. elliptica* Pursh; *Lotodes ellipticum* (Pursh) Kuntze; *P. laxiflora* Nutt. ex Torr. & Gray; *P. micrantha* A. Gray ex Torr.; *Psoralidium micranthum* (A. Gray) Rydb.] Sand dunes and other sandy sites at 1230 to 1770 m in Daggett, Garfield, Grand, Kane, Uintah, Washington, and Wayne cos.; Washington and Saskatchewan south to California, Arizona, New Mexico, and Oklahoma; 36 (viii).

Var. stenophylla (Rydb.) Toft & Welsh. Canyon Scurfpea. [*P. stenophylla* Rydb.; *Psoralidium stenophyllum* (Rydb.) Rydb.] Sandy sites at 1270 to 1830 m in Emery, Garfield, Grand (type from Wilson Mesa), Kane, San Juan, and Wayne cos.; endemic; 26 (xiii).

Var. stenostachys (Rydb.) Welsh comb. nov. based on *Psoralea stenostachys* Rydb., Bull. Torrey Bot. Club 42:46. 1913. Basin Scurfpea. [*Psoralidium stenostachys* (Rydb.) Rydb.] Dunes and other sandy sites in Juab, Kane, Millard, Salt Lake, Tooele (type from Government Well) and Weber cos.; endemic. Specimens from Salt Lake and Weber cos. are placed here tentatively because of the nature of the existing materials. The plants have not been collected in those counties in recent times, and they might well be extinct. The question of their varietal status might therefore be moot; 27 (ii).

Psoralea megalantha Woot. & Standl. Large-flowered Breadroot. [*Pediomeelum megalanthum* (Woot. & Standl.) Rydb.] Subcaulescent to short-caulescent, 4-15 cm tall, from slender subterranean caudex branches arising from deep-seated tuberous roots; stems with 0-3 elongated internodes,

incurved-strigose or with a few (rarely most) hairs spreading-ascending; leaves mainly 5 (8) -foliolate; petioles 1.2-9.5 cm long, pubescent like the stems or more commonly mainly spreading-hairy; leaflets 9-34 mm long, 4-23 mm wide, cuneate-obovate to subrhombic, gray-green, strigulose, and punctate beneath, yellow-green, punctate, and strigose overall above; stipules scarious, 2-15 mm long; peduncles 1.4-5 cm long; racemes mainly 6- to 24-flowered, 2-5 cm long; pedicles 1.5-5 mm long, bracts commonly bidentate, lance-ovate, 3-12 mm long; flowers 12.5-21 mm long, the banner, wings, and keel commonly purple or suffused with purple; calyx 12.5-18.5 mm long, the tube 5.5-8 (9) mm long, strongly gibbous, the lower tooth 4-9 (10) mm long, only somewhat broader than the lateral ones; pods included in the calyx. Mixed desert shrub, juniper-pinyon woodland, and blackbrush communities at 1430 to 1830 m in Duchesne, Grand, San Juan, Uintah, and Wayne cos.; Colorado and New Mexico. The plants of large-flowered breadroot are quite uniform, with two exceptions. Those from San Juan Co. tend to produce stems with elongate internodes, some of them with dense ascending-spreading pubescence. A collection from eastern Wayne Co. has flowers only 12.5 mm long. Much more material is necessary before decisions as to status of these variations will be possible; 16 (viii).

Psoralea mephitica S. Wats. Skunk Breadroot. [*Pediomeelum mephiticum* S. Wats.] Rydb.; *Pediomeelum retrorsum* Rydb.; *P. retrorsa* (Rydb.) Tidestr. in Tidestr. & Kittell; *P. mephitica* var. *retrorsa* (Rydb.) Kearney

& Peebles.] Acaulescent to subacaulescent, 4.5–15 cm tall, from slender subterranean caudex branches arising from deep-seated tuberous roots; stems lacking or with very short internodes above ground, retrorsely hairy; leaves mainly 5-foliolate; petioles 3.2–12 cm long, retrorsely hairy; leaflets 11–35 mm long, 4–28 mm wide, obovate to broadly so, gray-green, strigose overall, and punctate beneath, green to yellow-green, strigose overall (more densely along veins), and punctate above; stipules scarious, 4–12 mm long; peduncles 2–6 cm long; racemes mainly 12- to 35-flowered, 1.5–4.5 cm long; pedicels 1.5–3.5 mm long; bracts mainly not bidentate, elliptic-obovate, 5–12 mm long; flowers 10.5–12.8 mm long, the banner whitish or yellowish, the wings and keel purple or suffused with purple; calyx 9–12.5 mm long, the tube 3.5–4.5 mm long, strongly gibbous at the base, the lower tooth 4.5–9 mm long, about twice as broad as the others; pods included in the calyx. Blackbrush and pinyon-juniper communities at 1470 to 1700 m in southeastern Washington Co.; Arizona, Nevada, and California. This species was described by Sereno Watson simultaneously with *P. castorea* (Proc. Amer. Acad. 14:291. 1879). The type locality of both of these taxa is cited in the original descriptions as “near Beaver City, S. Utah.” The type collections were both by Dr. E. Palmer (No. 96 for *P. castorea*, and No. 97 for *P. mephitica*). Palmer (Amer. Nat. 12:601. 1878) in describing the use of these plants by Indians (as food) noted that *P. castorea* S. Wats. “grows in exposed sandy localities between Beaver Dams, Arizona, and St. Thomas, Nevada.” [sic]. Of *P. mephitica*, Palmer (l.c.) notes that “it is abundant on the low places between the hills south-east from St. George, Southern Utah, and the Pah-Utes resort there to collect its roots” (sic). Thus, the type localities can be inferred as being in northwestern Arizona or south-eastern Nevada for *P. castorea*, and in the hills to the southeast of St. George for *P. mephitica*. There is no evidence to support the idea that *P. castorea* was ever collected in Utah, and it is herein excluded. Finally, no specimen of any of the breadroot psoraleas is known from the Great Ba-

sin portion of Utah in modern collections, and it seems likely that none was taken there in the past; 6 (0).

Psoralea pariensis Welsh & Atwood in Welsh, Atwood, & Reveal. Paria Breadroot. Acaulescent or subacaulescent, 2–9 cm tall, from slender subterranean caudex branches arising from deep-seated tuberous roots; stems lacking or with very short internodes above ground, strigose; leaves mainly 3-foliolate; petioles 1.3–7 cm long, strigose; leaflets 9–25 mm long, 7–22 mm wide, obovate or orbicular, cuneate, rounded to truncate or emarginate apically, gray-green, glandular, and strigose beneath, yellow-green, glandular and strongly strigose along veins above; stipules scarious, 4–10 mm long; peduncles 0.5–2.8 cm long, the hairs appressed to ascending; racemes mainly 6- to 15-flowered, 1–2.5 cm long; pedicels 1–3.8 mm long; bracts abruptly acuminate, 4–8 mm long; flowers 8.8–12.5 mm long, the banner cream to ochroleucous, the wings and keel purple or suffused with purple; calyx 8.6–11.4 mm long, the tube 3.3–4.6 mm long, more or less gibbous at the base, the lower calyx teeth 5.3–6.8 mm long, about twice broader than the others; pods included in the calyx, about 9 mm long. Ponderosa pine and juniper-pinyon woods at 1700 to 2430 m in Garfield (type from Bryce Canyon) and Kane cos.; endemic; 8 (ii).

Psoralea tenuiflora Pursh. Prairie Scurfpea. [*Psoralidium tenuiflorum* (Pursh) Rydb.; *P. obtusiloba* Torr. & Gray; *Psoralidium bigelovii* Rydb.; *P. bigelovii* (Rydb.) Tidestr.; *P. tenuiflora* var. *bigelovii* (Rydb.) Macbr.; *P. floribunda* Torr. & Gray; *Psoralidium floribundum* (Nutt.) Rydb.] Caulescent, 40–100 cm tall or more, forming large clumps; stems with 8 or more elongated internodes, strigose; leaves 3- to 5-foliolate, persistent at flowering; petioles 0.1–2.2 cm long, strigose to strigulose; leaflets 3–5, 6–40 mm long, 2–16 mm wide, oblanceolate throughout, mainly rounded to a cuspidate apex, gray-green and strigose beneath, yellow-green and glabrous or pubescent only along veins above; stipules scarious, 2–13 mm long, strigose; peduncles 0.5–7 cm long, or lacking, sometimes bracteate or some flowers axillary; racemes mainly 7- to

21-flowered, 9–5.9 cm long; bracts ovate-acuminate, glabrous dorsally, 1.5–2.5 mm long, persistent; flowers 4.5–6 cm long, the petals indigo; calyx 2.5–3.2 mm long, the tube 1.5–2 mm long, campanulate, not gibbous, the lower tooth 0.8–1.7 mm long, noticeably larger than the others; pods 1-seeded, glabrous, conspicuously glandular. Pinyon-juniper, sagebrush, and mountain brush communities at 1700 to 2200 m in Garfield, Iron, Kane, and Washington cos.; North Dakota and Montana southward to Arizona, Texas, and Mexico. The segregation of varieties from among our specimens seems unwarranted; 14 (iii).

PSOROTHAMNUS Rydb.

Shrubs, armed; leaves alternate, odd-pin-

nate, with 5 or more leaflets, glandular-dotted; stipules subulate or vestigial; peduncles opposite the leaves; flowers in lax racemes; calyx campanulate, 10-ribbed, 5-lobed; corolla papilionaceous, the petals all inserted on the hypanthium; stamens 9 or 10, monadelphous; petals mainly indigo; pods 1- to 2-seeded, indehiscent, exserted from the calyx. Note: Traditional treatments have placed the species herein recognized as *Psorothamnus* within an expanded *Dalea* (q.v.).

REFERENCES

- RYDBERG, P. A. 1919. *Psorodendron* Rydb., and *Psorothamnus* Rydb. N. Amer. Fl. 24:41–48.

1. Branchlets densely reflexed-puberulent, bearing conspicuous yellow- to red-orange resinous glands 2
- Branchlets merely appressed-strigose, lacking glands or only obscurely glandular 3
- 2(1). Calyx lobes ovate to oval, obtuse to rounded, or the lowermost ovate-acute ..
..... *P. thompsonae*
- Calyx lobes all lance-attenuate *P. polyadenius*
- 3(1). Calyx villous with contorted spreading hairs, the lateral teeth linear-lanceolate, quite as long as the tube; plants rare in Kane Co.
..... *P. arborescens*
- Calyx strigose with appressed hairs or glabrate, the lateral teeth lance-attenuate, mostly shorter than the tube; plants locally common in Garfield, Kane, San Juan, and Washington cos. *P. fremontii*

Psorothamnus arborescens (Torr.) Barneby. Beauty Indigo-bush. [*Dalea arborescens* Torr. in A. Gray; *Parosela arborescens* (Torr.) Heller; *Psorodendron arborescens* (Torr.) Rydb.; *Dalea amoena* S. Wats.; *Parosela amoena* (S. Wats.) Vail; *Psorodendron amoenum* (S. Wats.) Rydb.; *Parosela johnsonii* var. *pubescens* Parish; *Psorodendron pubescens* (Parish) Rydb.; *Dalea fremontii* var. *pubescens* (Parish) L. Benson; *D. amoena* var. *pubescens* (Parish) Peebles.] Armed shrubs, 4–10 dm tall or more; branchlets strigose to strigulose, sparingly glandular; stipules 1–2 mm long, subulate; leaves 1.4–3.8 cm long; leaflets 7–15, 1–10 (12) mm long, 0.7–1.5 mm wide, glandular beneath, strigose on both sides, linear to

narrowly oblong, obtuse to rounded, the uppermost lateral leaflet often confluent with the terminal; peduncles 0.2–0.6 cm long, or the lowermost flower axillary; racemes 11- to 21-flowered, 1.8- to 4.5 cm long, the rachis pilosulous; bracts 1.5–3.5 mm long, lance-aristate, villosulous; calyx 8–10 mm long, the tube 3.8–4.8 mm long, definitely 10-ribbed, villous, the teeth 3.6–5.2 mm long, villous, not markedly differing in width; flowers 8.1–10.6 mm long, indigo; pods conspicuously glandular-dotted. Mixed desert shrub at 1230 to 1530 m in Kane Co.; Arizona and Nevada. Our material belongs to var. *pubescens* (Parish) Barneby; 3 (i).

Psorothamnus fremontii (Torr.) Barneby.

Fremont Indigo-bush. [*Dalea fremontii* Torr. in A. Gray; *Parosela fremontii* (Torr.) Vail; *Psorodendron fremontii* (Torr.) Rydb.; *Dalea johnsonii* S. Wats., type from near St. George; *Parosela johnsonii* (S. Wats.) Vail; *Psorodendron johnsonii* (S. Wats.) Rydb.; *Parosela johnsonii* var. *minutifolia* Parish; *D. fremontii* var. *minutifolia* (Parish) L. Benson]. Armed shrubs, 5–15 dm tall or more; branchlets strigose, sparingly if at all glandular; stipules 0.3–1.5 mm long, fragile; leaves 1.8–6.5 cm long; leaflets (1) 3–9, 3–14 mm long, 0.8–6 mm wide, glandular beneath, strigose on both sides, linear to oblong or elliptic, obtuse to rounded, the uppermost often confluent with the rachis; peduncles 0–2.2 cm long, or some flowers axillary; racemes 7- to 41-flowered, 3.5–14.3 cm long, the rachis strigose to strigulose; bracts 0.8–1.8 mm long, lanceolate, glabrous or else foliose and with 1–5 leaflets; calyx 4.5–6.5 mm long, the tube 2.5–3.3 mm long, obscurely if at all 10-ribbed, appressed strigose to glabrate, the teeth 1.8–3.2 mm long, strigose, the upper markedly wider than the others; flowers 8.5–12 mm long, indigo; pods glandular-dotted. Blackbrush, creosote bush, mixed

desert shrub, and (less commonly) pinyon-juniper communities at 730 to 2270 m in Garfield, Kane, San Juan, and Washington cos.; Nevada, Arizona, and California. The plants are strikingly beautiful, contrasting indigo-colored flowers against grayish foliage; 44 (vii).

Psorothamnus polyadenius (Torr.) Rydb. Glandular Indigo-bush. Armed shrubs, 1.5–8 dm tall or more; branchlets velvety with retrorse short hairs, conspicuously glandular with yellow- or red-orange resinous glands; stipules vestigial or to 0.5 mm long; leaves 0.4–2.8 cm long; leaflets 5–13, 1.2–6.5 mm long, 1–5 mm wide, oval to obovate, or obcordate, glandular beneath, strigose on both sides, obtuse, rounded, or emarginate, the uppermost often confluent to each other and to the rachis; peduncles 0.8–2.7 cm long; racemes mainly 6- to 18-flowered, 2–5 cm long, the rachis retrorsely hairy; bracts 1–2.5 mm long, lanceolate, pilose; calyx 5.5–7.2 mm long, the tube 2.5–3.5 mm long, 10-ribbed, villous, the teeth 3.5–4.5 mm long, villous, lance-subulate, all about alike; flowers 7.5–9 mm long, indigo; pods glandular-dotted. Two rather distinctive varieties are present in Utah.

1. Branches strongly divaricate; leaflets flat, commonly less than 4 mm long; plants more than 2.5 dm tall, of Washington Co. *P. polyadenius* var. *polyadenius*
- Branches merely ascending, or rarely some divaricate; leaflets curved, at least some over 4 mm long; plants commonly less than 2.5 dm tall, of Emery Co. *P. polyadenius* var. *jonesii*

Var. *jonesii* Barneby. [*Dalea nummularia* M. E. Jones, type from Green River.] Salt desert shrub community, on Mancos Shale formation (Blue Gate Member) at ca. 1470 m in Emery Co.; endemic; 3 (0).

Var. *polyadenius*. [*Dalea polyadenia* Torr. ex S. Wats.; *Parosela polyadenia* (Torr.) Heller.] Creosote bush-Joshua tree community on pedimental gravels, Beaver Dam Mts., Washington Co.; Nevada and California; 2 (0).

***Psorothamnus thompsonae* (Vail) Welsh & Atwood.** Thompson Indigo-bush. Armed shrubs, 2.5–8 dm tall or more; branchlets velvety with retrorse short hairs, con-

spicuously glandular with yellow- to orange-red mammiform resinous glands; stipules vestigial or to 0.8 mm long; leaves 0.7–5 cm long; leaflets 7–17, 1–10 mm long, 0.6–4 mm wide, linear to oblong, oval, or obcordate, glandular and strigose to glabrate beneath, strigose above, the uppermost jointed to the rachis; peduncles 0.4–1.8 cm long, rarely obsolete and some flowers axillary; racemes mainly 8- to 25-flowered, 2–9 cm long, the rachis retrorsely hairy; bracts 0.5–1.5 mm long, lanceolate, glabrous or hairy, soon deciduous; calyx 3.7–5 mm long, the tube 2.1–3.2 mm long, conspicuously 1-ribbed, glabrous or villous, ovate to oval,

obtuse or only the lowermost acute; flowers 7.8–10.8 mm long, indigo or purple-pink; pods glandular-dotted. Two distinctive varieties occur in Utah.

- 1. Calyx tube villous; leaflets linear; plants of San Juan Co. *P. thompsonae* var. *whitingii*
- Calyx tube glabrous; leaflets oblong to oval or obcordate; plants of various distribution *P. thompsonae* var. *thompsonae*

Var. *thompsonae*. [*Parosela thompsonae* Vail]. Mixed desert shrub and salt desert shrub communities at 1170 to 2270 m in Garfield, Kane (? , the type supposedly from near Kanab, but more likely from Arizona), San Juan, and Wayne cos.; Arizona. There are no modern collections of this taxon from Kane Co.; 20 (iv).

Var. *whitingii* (Kearney & Peebles) Barn-
eby. [*Dalea whitingii* Kearney & Peebles]. Mixed desert shrub community at 1230 to 1530 m in San Juan Co.; Arizona; 1 (0).

ROBINIA L.

Shrubs or trees, often armed; leaves alter-
nate, odd-pinnate, the leaflets petiolulate
and stipulate; stipules setaceous and ca-
ducous or persistent as spines; flowers in ax-
illary racemes, white, pinkish, or pink, very
showy, often aromatic; calyx campanulate
to turbinate the 5 teeth triangular to
triangular-acuminate; corolla papilio-
naceous; stamens 10, diadelphous; ovary
subsessile or sessile; pods oblong, straight,
laterally flattened, tardily dehiscent.

- 1. Uppermost pair of calyx teeth connate almost to the apex, forming an
emarginate lip; branchlets and peduncles lacking hispid processes *R. pseudoacacia*
- Uppermost pair of calyx teeth free for about two-thirds of their length;
branchlets and often the peduncles hispid 2
- 2(1). Branchlets and peduncles both glandular-hispid; shrubs, cultivated *R. hispida*
- Branchlets lacking processes; peduncles glandular-hispid; trees, cultivated or
indigenous (in Washington Co.) *R. neomexicana*

***Robinia hispida* L.** Rose-Acacia. Shrubs,
arising from root sprouts, spreading, com-
monly 1–2 m tall, except when grafted;
branchlets both hispid and glandular-hispid;
leaves 9.5–27 cm long; leaflets 7–13, 11–60
mm long, 7–40 mm wide, ovate or lance-
ovate, elliptic, or oblong, obtuse, cuspidate,
sparingly villous beneath, glabrous above;
petioles hispid near the base; stipules obso-
lete; peduncles 1–4 cm long, hispid; ra-
cemes 3- to 10-flowered, 3–8 cm long; flow-
ers 18–30 mm long, rose-pink; calyx
turbinate-campanulate, the tube 4.5–6 mm
long, the teeth 3.5–7 mm long, triangular-
acuminate; pods hispid, seldom produced.
Cultivated ornamental in Utah Co., and
likely elsewhere; indigenous from Virginia
and Kentucky to Georgia and Alabama.
Evidence seems to indicate that rose-acacia

is a sterile triploid, at least in part. Lack of
fruit in plants from Utah seems to support
this contention; 5 (ii).

***Robinia neomexicana* A. Gray.** New
Mexico locust. [*R. neomexicana* var. *luxuri-
ans* Dieck.; *R. luxurians* (Dieck.) Schneid ex
Taroua & Schneid; *R. breviloba* Rydb.; *R.
subvelutina* Rydb.] Small trees or shrubs,
mainly 1–8 m tall; branchlets villosulous,
rarely glandular; leaves 8–20 (28) cm long;
leaflets 9–19, 12–40 mm long, 7–20 mm
wide, lance-oblong to oblong, obtuse, cuspi-
date, sparingly pubescent above and below,
finally glabrate on one or both sides; pet-
ioles villosulous near the base; stipules 3–10
mm long or more, often spiny; peduncles
1–4 cm long, glandular-pubescent to hispid
throughout; racemes 3- to 14-flowered, 3–8
cm long; flowers 16–24 mm long, pink; ca-

lyx campanulate, the tube 5–8 mm long, the teeth 3–5 mm long, triangular-acuminate pods 40–80 mm long, glandular-pubescent to hispid or glabrous. Talus slopes and terraces in Zion Canyon, Zion National Park, Washington Co.; Colorado, Nevada, Arizona, New Mexico, Texas, and Mexico. The plant is also known from cultivation in Cache and Utah cos., and is probably present elsewhere. The pink-flowered tree locusts of our region are all more or less involved through hybridization with the New Mexico locust and the black locust; 4 (i).

Robinia pseudoacacia L. Black Locust. Trees to 25 m tall or more; branchlets puberulent to villousulous, lacking glands; leaves (6) 8.5–26 cm long; leaflets (5) 11–25, 11–60 mm long, 6–30 (38) mm wide, lance-oblong to oblong, obtuse to retuse or cuspidate, puberulent to glabrate on both sides; petioles villousulous to pilose near the base; stipules minute, or represented by spines; peduncles 1.4–4.3 cm long, puberulent to villousulous; racemes 11- to 27-flowered, 4–13 cm long; flowers 12–20 (23) mm long, white (fading cream), or pale pink; calyx

broadly campanulate to turbinate, the tube 3.5–5.5 mm long, the teeth 1.5–2 mm long, the upper pair connate, the sinus shallow; pods 40–120 mm long, glabrous. Cultivated ornamental, street, and shade trees, long-persisting and escaping; now known from Carbon, Cache, Grand, Kane, Millard, Salt Lake, Sanpete, Utah, Washington, and Wayne cos., and likely more widely cultivated; indigenous in the eastern United States. This is a handsome shade tree, with very hard wood. The flowers yield nectar, and the wood has been used for fence posts; 34 (x).

SOPHORA L.

Trees or herbs, unarmed; leaves alternate, odd-pinnately compound; stipules obsolete or herbaceous; flowers in terminal racemes or panicles, perfect, papilionaceous; calyx 5-toothed; petals all distinct; stamens 10, distinct or essentially so; ovary stipitate; pods spreading to pendulous, subterete, constricted between the seeds, indehiscent or tardily so.

1. Plants trees, cultivated; flowers borne in panicles in midsummer *S. japonica*
— Plants herbaceous, indigenous; flowers in racemes, opening in spring 2
- 2(1). Flowers blue-purple to blue; leaflets more than 5 times longer than broad,
silvery-hairy *S. stenophylla*
— Flowers white to cream; leaflets less than 5 times longer than broad, gray-
green *S. nuttalliana*

Sophora japonica L. Japanese Pagoda-tree. Trees to 12 m tall, the bark green and smooth for some years; branchlets sparingly villousulous to glabrate, leaf bases expanded, obscuring the axillary buds; leaves 12–23 cm long; leaflets 7–17, 14–60 mm long, 8–29 mm wide, lance-oblong to lanceolate, acute and apiculate, strigose beneath, glabrate or glabrous above; stipules obsolete; panicles many-flowered, 15–40 cm long; flowers 11–14 mm long, white to cream; calyx broadly campanulate 5.5–6.5 mm long, the tube 4.5–5.1 mm long, the teeth 0.8–1.2 mm long, broadly triangular; pods mainly 50–100 mm long, fleshy, constricted between the seeds. Cultivated ornamental,

widely planted, but our records only from Salt Lake and Utah cos.; introduced from China; 5 (i).

Sophora nuttalliana Turner. Silky Sophora. [*S. sericea* Nutt.] Perennial, caulescent, 12–27 (30) cm tall, from a rhizome; pubescence essentially basifixed; stems ascending to erect; stipules 1.5–4 mm long, distinct, caducous; leaves 2.5–6 (7) cm long; leaflets 13–23, 2–11 mm long, 0.8–6 mm wide, oblong-obovate to obovate, rounded to retuse, often folded, strigose beneath, glabrous above; peduncles 0.8–3 cm long; racemes mainly 8- to 52-flowered, 3–9 cm long at anthesis, the axis 3–13 cm long in fruit; bracts 3–7 mm long; pedicels 2–4 mm

long; bracteoles 1; calyx 8–10.5 mm long, gibbous, the tube 6.4–8.5 mm long, obliquely short-cylindric, the teeth 2–2.5 mm long, triangular; flowers 14–19 mm long, white to cream (fading cream); pods erect-ascending, stipitate, the stipe 6–12 mm long, the body 12–40 mm long, 3–4.5 mm thick, constricted tightly between the usually 1–3 seeds, strigose. River bottoms and roadsides at 1070 to 1670 m in San Juan and Washington cos.; Wyoming and South Dakota, south to Arizona, New Mexico, and Texas; 2 (0).

Sophora stenophylla A. Gray. Silvery Sophora. Perennial, caulescent, 13–41 cm tall (above ground), from deeply seated rhizomes; pubescence basifixed; stems ascending to erect; stipules 3–12 mm long, distinct, caducous, or obsolete; leaves 1.7–5.6 cm long; leaflets 9–15, 7–27 mm long, 0.5–4 mm wide, linear to narrowly oblong, acute to attenuate, silvery pilosulous, the pubescence fading yellowish in time; peduncles 1.7–5 cm long; racemes mainly 12- to 39-flowered, 5–17 cm long at anthesis, 6–23.5 cm long in fruit; bracts 3–7 mm long; pedicels 1–8 mm long; bracteoles 0; calyx 6.5–10.8 mm long, gibbous, the tube 4.8–7.2 mm long, obliquely short-cylindric, the teeth 1.7–3.6 mm long, ovate-triangular; flowers 15–27 mm long, blue-purple to blue; pods spreading declined, stipitate, the stipe 8–16 mm long, the body 15–60 mm long, 6–8 mm wide, strongly constricted between the usually 1–5 seeds, strigose. Sand dunes and other sandy sites, mainly in mixed desert shrub communities, at 900 to 2270 m in Emery, Garfield (at Red Canyon, with ponderosa pine), Grand, San Juan, Uintah, Washington, and Wayne cos.; New Mexico and Arizona. This is one of the most beautiful of the legume species in Utah; 41 (vi).

SPARTIUM L.

Shrubs, unarmed; leaves alternate to subopposite, simple; stipules obsolete; flowers in terminal, erect racemes, papilionaceous, perfect; calyx 1-lipped, the 5 teeth marginal, all on the lower side of the calyx, the three central ones approximate, the lateral ones somewhat removed; petals yellow, the

keel pubescent along the lower edge, and with a porrect beak; stamens 10, monadelphous; ovary sessile; pods spreading-ascending, laterally compressed, many-seeded.

Spartium junceum L. Spanish Broom. [*Genista juncea* (L.) Lam.] Shrubs, 15–25 dm tall; leaves simple, 8–27 mm long, 0.5–4 mm wide, linear to narrowly oblanceolate, acute to obtuse, strigose on both sides; peduncles 3–22 cm long (from last leaf to first flower); racemes 3- to 16-flowered, 3–16 cm long; bracts minute, caducous; bracteoles 0; pedicels 1–4 mm long; calyx oblique, 7–8 mm long, glabrous, the teeth minute; flowers 21–26 mm long, yellow; pods sessile, 50–80 mm long, 5–7 mm wide, strigose, dehiscent. Cultivated ornamental in Washington Co.; widely cultivated in the South; introduced from southern Europe; 1 (i).

SPHAEROPHYSA DC.

Perennial, caulescent, from rhizomes; leaves alternate, odd-pinnate; stipules adnate to the petiole base, all distinct; flowers papilionaceous, borne in axillary racemes, each subtended by a single bract; bracteoles 1; calyx 5-toothed; petals 5, dull red, drying lavender to brown; stamens 10, diadelphous; ovary enfolded by the staminal sheath; style glabrous except for a tuft of hair below the stigma; pods stipitate, bladdery-inflated, subunilocular.

Sphaerophysa salsula (Pallas) DC. [*Phaca salsula* Pallas; *Swainsona salsula* (Pallas) Taub. in Engl. & Prantl.] Perennial, caulescent, 40–70 cm tall, from a deeply placed rhizome; pubescence basifixed; stipules 1–4 mm long, all distinct; leaves 3–10 cm long; leaflets 15–25, 3–18 mm long, 1–7 mm wide, oblong-obovate to elliptic, retuse to obtuse and apiculate, strigose beneath, glabrous above; peduncles 2.5–9 cm long; racemes 5- to 17-flowered, the flowers ascending in anthesis, finally nodding, the axis 2.5–9 cm long in fruit; bracts 1–2 mm long; pedicels 2.5–8 mm long; bracteoles 2; calyx 5–6 mm long, the tube 3.8–4.6 mm long, campanulate, the teeth 1.2–2 mm long, triangular; flowers 12–14 mm long, dull-red, fading lavender to brown; pods ascending to declined, stipitate, the stipe 4–7 mm long,

the body bladdery-inflated, ovoid, 13–24 mm long, 9–20 mm wide (when pressed), unilocular, strigulose. Introduced weedy species known from the Uinta Basin and to be expected anywhere; widespread in the western United States; adventive from Asia. This plant resembles an *Astragalus* species, and has been mistaken twice as belonging to previously undescribed and unnamed indigenous species (*A. violaceus* St. John; *A. iochrous* Barneby). Generic concepts revolving around this genus are unresolved and it seems likely that the plants will ultimately

be placed with some earlier named genus; 1 (0).

THERMOPSIS R. Br.

Perennial herbs, caulescent, from rhizomes; leaves alternate, palmately trifoliate; stipules foliaceous; flowers papilionaceous, borne in terminal racemes; bracts herbaceous, persistent; calyx 5-toothed; petals 5, yellow or suffused with purple, the keel rounded; stamens 10, distinct; ovary stipitate, the style glabrous; pods narrowly oblong, flattened, many-seeded.

1. Pods straight not especially loment-like, erect or ascending; plants mostly 20–70 cm tall or more, common through most of Utah *L. montana*
- Pods curved, loment-like, spreading to recurved; plants mostly 14–40 cm tall, known from Uintah Co. *L. rhombifolia*

***Thermopsis montana* Nutt. in T. & G.** Golden Pea, Yellow Pea. Caulescent, 20–75 (100) cm tall, the stems erect, pilosulous to glabrate; stipules foliar, lanceolate to ovate; 13–60 mm long, 3–30 mm wide; petioles 0.8–3.7 cm long; leaflets 3, 21–92 mm long, 5–36 mm wide, elliptic to lanceolate or oblanceolate, acute to rounded, pilosulous beneath, glabrous to glabrate above; peduncles 2.2–13 cm long; bracts 5–11 mm long; racemes mainly 2- to 23-flowered, 6–25 cm long in anthesis, the axis 9–28 cm long in fruit; flowers 20–26 mm long, yellow; calyx 10.2–12.3 mm long, the tube 7–8.3 mm long, obliquely campanulate, the teeth 3.1–4 mm long, ovate-triangular; pods erect or ascending, stipitate, the stipe 2.5–6 mm long, the body 40–54 mm long, 5–7 mm wide, pilose, stramineous or turning black. Moist sites along streams, in meadows, around seeps and springs at 1251 to 3416 feet in Box Elder, Daggett, Duchesne, Garfield, Juab, Kane, Millard, Morgan, Piute, San Juan, Sanpete, Sevier, Summit, Uintah, Utah, Wasatch, Washington, Wayne, and Weber cos.; British Columbia east to Montana and south to California, Arizona, and New Mexico. The abundant materials present in Utah herbaria demonstrate a wide range of variation in leaflet and stipule size and shape. There appears to be no basis for segregation of subordinate taxa, even those from the

southern tier of counties known previously as *T. pinetorum* Greene or as *T. ovata* (Robins.) Rydb. [*T. montana* ssp. *ovata* Robins. ex Piper; *T. montana* var. *ovata* (Robins.) St. John]. The leaves of plants from Washington Co. average larger, but that is hardly a basis for segregation; 106 (xv).

***Thermopsis rhombifolia* Nutt. ex Richards.** Caulescent, 15–40 cm tall, the stems erect, glabrate; stipules foliose, ovate to oblanceolate, 6–30 mm long, 2–22 mm wide; petioles 0.3–2.5 cm long; leaflets 3, 15–47 mm long, 7–25 mm wide, obovate to oblanceolate, obtuse to rounded, glabrous beneath and above; peduncles 0.5–5.8 cm long; bracts simple to foliose; racemes mainly 4- to 30-flowered, 2–10 cm long in anthesis, the axis 2–12 cm long in fruit; flowers 18–22 mm long; calyx 7.5–10 mm long, the tube 4.5–4 mm long, triangular-ovate; pods divaricate, finally recurved, loment-like, stipitate, the stipe 1.5–4 mm long, the body 25–70 mm long, 5–7 mm wide, pilose to glabrate. Sandy and clay soils, mainly where moist, at 1500 to 1800 m in Daggett (Neese 4532 BRY) and Uintah Co. (Welsh 158; Cronquist 11499 BRY); Alberta and Saskatchewan south to Colorado and Nebraska.

TRIFOLIUM L.

Perennial or short-lived perennial or an-

nual, caulescent or acaulescent, from a tap-root and caudex or rhizome; leaves alternate, palmately to pinnately 3-foliate, or rarely 4- to 7-foliate, commonly serrate throughout, rarely entire; stipules membranous to foliaceous, often connate; flowers papilionaceous, borne in terminal or axillary, pedunculate to sessile, subcapitate heads or racemes; calyx 5-toothed; petals 5, pink, white, or red-purple, withering and persistent, finally investing the pod; stamens 10, diadelphous; pods usually shorter than the calyx, indehiscent, 1- to several-seeded.

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1. Plants acaulescent or subacaulescent, mainly 1.5-10 cm tall 2
- Plants caulescent, with 1 or more elongated internodes (see also *T. parryi*); mainly 10-60 cm tall 7
- 2(1). Heads 1- to 4-flowered, essentially sessile, the flowers 15-23 mm long; plants of high elevations in Uinta and LaSal mountains *T. nanum*
- Heads several-flowered, sessile or pedunculate, the flowers either shorter or heads pedunculate; plants of various distribution 3
- 3(2). Plants densely pulvinate-caespitose, matted 4
- Plants loosely caespitose, not especially mat-forming 5
- 4(3). Calyces densely woolly-villous; herbage silvery-hairy; plants known from San Francisco Mts., Beaver Co. *T. andersonii*
- Calyces strigose to strigulous; herbage green, merely strigose; plants of Daggett, Summit, and San Juan cos. *T. andinum*
- 5(3). Leaflets toothed; calyces villosulous to pilosulous; flowers less than 9 mm long; plants of moderate elevation, broadly distributed *T. gymnocarpon*
- Leaflets entire, or if toothed then the calyces glabrous; flowers more than 9 mm long; plants of high elevations 6
- 6(5). Leaflets entire; calyces strigose; plants of the Uinta, LaSal, Abajo, and Henry mountains *T. dasyphyllum*
- Leaflets toothed; calyces glabrous; plants of the Uinta, LaSal, and Abajo mountains *T. parryi*
- 7(1). Plants stoloniferous, prostrate and rooting at the nodes; flowers white; calyx not bladderly-inflated; introduced, widespread *T. repens*
- Plants not stoloniferous (except in *T. fragiferum*), usually erect or ascending, not rooting at the nodes; flowers mainly pink to red-purple 8
- 8(7). Calyx soon bladderly-inflated and enclosing the corolla; plants introduced, uncommon *T. fragiferum*

- Calyx not accrescent or only slightly so, never enclosing the corolla; plants various 9
- 9(8). Heads sessile or nearly so, commonly immediately subtended by a trifoliolate bract; plants cultivated, escaping, and persisting *T. pratense*
- Heads with well-developed peduncles, not immediately subtended by foliose bracts; plants indigenous or cultivated 10
- 10(9). Peduncles bent at the apex, the heads reflexed or appearing turned to one side 11
- Peduncles straight, the heads erect 13
- 11(10). Calyx tube and teeth villous; ovary with hairs near the apex along the ventral side; plants of lower middle elevations in Juab, Sevier, and Beaver (?) cos. *T. eriocephalum*
- Calyx tube and teeth sparingly villosulous to glabrous; ovary glabrous, or scaly, but not hairy as above; plants of various distribution 12
- 12(11). Heads definitely longer than broad; calyx teeth shorter than the tube; basal leaves prominent, long-petioled; plants of Washington and Iron cos. *T. macilentum*
- Heads about as broad as long; calyx teeth subequal to the tube; basal leaves more shortly petioled than the subbasal ones; plants of Beaver, Emery, Garfield, Grand, Piute, San Juan, Sanpete, Sevier, Summit, and Utah cos. *T. kingii*
- 13(10). Heads subtended by a spinose-toothed involucre 14
- Heads lacking an involucre; plants from a caudex, variously distributed, common or uncommon 15
- 14(13). Plants annual; head 5–20 mm wide; plants of Salt Lake, Weber, and Cache cos. *T. variegatum*
- Plants perennial; head 20–30 mm wide; of Tooele and Salt Lake cos. *T. wormskjoldii*
- 15(17). Flowers mainly 7–9 mm long; heads axillary, from the uppermost nodes; plants cultivated, escaping, and persisting *T. hybridum*
- Flowers 10–16 mm long; heads terminal, solitary; plants indigenous 16
- 16(15). Calyx glabrous; flowers mainly 14–16 mm long; plants rare in Sevier Co. *T. beckwithii*
- Calyx villosulous to pilosulous; flowers mainly 10–12 mm long; plants wide-spread in Utah *T. longipes*

Trifolium andersonii A. Gray. Anderson Clover. Acaulescent, densely pulvinate-caespitose, mat-forming, 0.8–3 cm tall, from woody caudex branches and a thick taproot, the stems obscured by imbricated stipules and persistent leaf bases; petioles 0.3–1.1 cm long; leaflets 3–3.8 mm long, 1.5–3.4 mm wide, oblanceolate to obovate, entire or toothed near the apex and the teeth more

or less obscured by pubescence, villosulous on both sides with hairs 0.3–0.7 mm long, commonly folded, mucronate; stipules scarious, pilose, 5–9 mm long; heads lacking an involucre, borne subsessile or on peduncles 0.2–0.6 cm long, these densely pilose; flowers 4–9, the banner reddish-purple, the keel and wings pale, 8–9 mm long, on pedicels ca. 0.5 mm long (obscured by pi-

lose hairs); calyx 8.5–9.5 mm long, the tube 3–4 mm long, campanulate, obscured by villous hairs to 1.5 mm long, the teeth 5–7 mm long, subulate, villous; pods unknown (in our material). Volcanic gravels in pinon-juniper woodland at 2130 m in San Francisco Mts., Beaver Co.; California and Nevada. Our plant differs in several salient features from *T. andersonii* sens. lat. It is therefore described as var. *friscanum* Welsh var. nov. Similis *Trifoliae andersonii* a qua imprimis differt pedunculis brevioribus, floribus parvioribus, et folium pili brevioribus. Holotype: Utah, Beaver Co., Grampian Hill, San Francisco Mts., Peabody, Taylor, & Thorne 406, 3 June 1976 (BRY); 3 (0).

Trifolium andinum Nutt. in Torr & Gray. Andean Clover. Acaulescent, densely pulvinate-caespitose, mat-forming, 0.3–5 cm tall, from woody caudex branches and a thick taproot, the stems obscured by imbricated stipules and persistent leaf bases; petioles 0–2.3 cm long; leaflets, 3, 2–12.5 mm long, 1.2–5 mm wide, oblanceolate to obovate, toothed in the apical third, strigose to strigulose on both sides, commonly folded, abruptly acuminate; stipules scarious, yellowish, glabrous except towards the tip, 3–9 mm long; heads closely subtended by reduced leaf-like bracts, these with or without a trifoliate bract, sessile or appearing pedunculate by elongation of internodes on floriferous branches, the internodes glabrous; flowers 7–15, in two closely associated heads, the banner violet-purple, the keel and wings ochroleucous, 9–12 mm long, on pedicels 0.5–1 mm long, these glabrous to strigose; calyx 5–7 (8.5) mm long, the tube 2.2–3.6 (4) mm long, sparingly pilose to glabrous, the teeth 2–3.8 (4.5) mm long, lance-subulate, pilose; pods 4–5 mm long, 2.3–2.7 mm wide. Ponderosa pine, sagebrush, or mixed shrub communities at 1970 to 2730 m in Daggett, Summit, and San Juan cos.; Wyoming and Arizona. The existence of Andean Clover in two centers in Utah (i.e., on the north slope of the Uintas and on Navajo Mountain) is without precedence among the legumes of Utah. The plants from Navajo Mountain differ in features of the flower, mainly in the length of the calyx teeth and tube.

Those from the Uinta Mountain centrum have calyx teeth subequal to or surpassing the tube; those from Navajo Mountain have calyx teeth much shorter than the tube; 6 (i).

Trifolium beckwithii Brewer ex S. Wats. Beckwith Clover. Caulescent, 12–40 cm tall, from rhizomes and thick roots; petioles of lower leaves 4–15 cm long, becoming shorter upwards; leaflets 3, 12–45 (50) mm long, 7–20 mm wide, elliptic to lance-elliptic or oblong, toothed from near the base, glabrous, flat, emarginate to apiculate; stipules prominent, herbaceous to scarious, 12–28 mm long; heads not subtended by an involucre, about as broad as long, 25–35 mm wide, terminal or axillary, on peduncles 5–26 cm long, these glabrous; flowers numerous, the petals pink, fading brown, 12–16.5 mm long; calyx 6.5–8 mm long, the tube 2.5–3.1 mm long, gibbous, glabrous, 5-veined, the teeth 3.5–4.9 mm long, lance-subulate, glabrous; pods 4.8–5.2 mm long, 1.9–2.1 mm wide. Meadows at 2070 to 2200 m in Sevier and Piute (?) cos.; California, Oregon, Nevada, Idaho, Montana, and South Dakota. Our collections from Utah have flowers and parts which average larger than for the species as a whole. The one locality for the species in Utah is common to *T. eriocephalum*; 2 (i).

Trifolium dasphyllum Torr. & Gray. Uinta Clover. Acaulescent, loosely mat-forming, 2–14 cm tall, from a caudex and thick taproot, the stems obscured by imbricated stipules and leaf bases; petioles 0.3–4 cm long; leaflets 3, 3–28 mm long, 1–5 mm wide, oblanceolate, entire, strigose beneath, strigose to glabrate above, flat or folded, sharply apiculate; stipules scarious, glabrous or strigose, 5–17 mm long; heads closely subtended by a long-lobed involucre, 11–18 mm wide, terminal, sessile or on peduncles 0.5–10 cm long, these strigose; flowers 6–16, erect, the banner violet to ochroleucous, the keel and wings purple, or all purple, 11–13 mm long; pedicels 0.5–1.5 mm long; calyx 4.7–9.1 mm long, the tube 2.5–2.9 mm long, strigose to glabrate, the teeth 1.9–6.4 mm long, subulate, strigose to glabrate; pods 4–6 mm long. Alpine meadows at 2730 to 3800 m in Daggett, Gar-

field, Grand, San Juan, Summit, and Uintah cos.; Montana, Wyoming, Colorado, and New Mexico. Plants from Utah are assignable to var. *uintense* (Rydb.) Welsh stat. nov. based on *T. uintense* Rydb., Bull. Torrey Bot. Club 34: 47. 1907, type from Uinta Mts. [*T. dasphyllum* f. *uintense* (Rydb.) McDermott; *T. dasphyllum* ssp. *uintense* (Rydb.) J. M. Gillett]; 117; (0).

***Trifolium eriocephalum* Nutt. in Torr. & Gray.** Woolly Clover. Caulescent, 12–36 (42) cm tall, from a caudex and tuberous to slender taproot; petioles 0.8–10 cm long; leaflets 3, 5–53 mm long, 5–12 mm wide, oblong to oblong-lanceolate or elliptic, toothed from near the base, thinly pilose to pilosulous on both sides, flat, obtuse to acute, apiculate; stipules foliaceous, glabrous or pilosulous, 15–55 mm long; heads lacking an involucre, 20–30 mm long, 20–27 mm wide, terminal, on peduncles 4–11 cm long, bent apically, thinly villosulous; flowers numerous, curved at base and reflexed, the petals purple to red-purple, rarely white, fading brown, 12–13.5 mm long; pedicels essentially obsolete; calyx 6.5–8 mm long, the tube 2.5–3.3 mm long, villosulous, the teeth 3.5–5.1 mm long, villosulous to glabrate, subulate; pods 2.5–7 mm long. Meadows at 1530 to 2270 m in Beaver (?), Juab, and Sevier cos.; Washington, Idaho, Montana, California, and Nevada. Our few specimens are assignable to var. *villiferum* (House) Martin [*T. villiferum* House; *T. eriocephalum* f. *villiferum* (House) McDermott; *T. eriocephalum* ssp. *villiferum* (House) J. M. Gillett]. The type (US) of *T. villiferum* is labeled as “S. Utah. Dr. E. Palmer 91, 1877.” Gillett (1971) cites the type locality as “Beaver City, Beaver Co., Utah.” The problem of type locality is the same as that for *Psoralea mephitica* (q.v.) and *P. castorea*, both cited as being from “near Beaver City, S. Utah.” That neither came from there was alluded to by Palmer (see citation under *P. mephitica*), and also by Jones (Cal. Acad. Sci. II. 5:632. 1895) who noted that “Dr. Palmer never collected any plants at Beaver City, Utah, during the year in which he collected these species *P. mephitica* and *P. castorea*, but he did collect in that year in the Beaverdam Mountains on the north-

eastern corner of Arizona at a place called Beaverdam [sic]. Thus, the type locality of *T. villiferum* is in doubt, but it seems likely that the specimens came from Washington Co., where it is unknown from recent collections; 8 (ii).

***Trifolium fragiferum* L.** Strawberry-headed Clover. Caulescent, 5–30 cm long, rhizomatous and sometimes stoloniferous, decumbent to ascending; petioles 0.5–13 cm long; leaflets 3, 6–22 mm long, 4–15 mm wide, obovate, toothed from near the base, truncate to retuse and apiculate, flat, glabrous to glabrate on both sides; stipules scarious, 8–20 mm long; heads involucre, many-flowered, subglobose, 10–22 mm wide, on peduncles 2–17 cm long, these glabrous; flowers 4–6 mm long, purplish, finally included within the accrescent calyx; calyx finally bladdery-inflated, pilose, reticulately veined around translucent lacunae. Meadows, roadsides, and other disturbed sites at 1370 to 2135 m in Cache, Garfield, Juab, Millard, Summit, Piute, Salt Lake, Utah, and Weber cos., and likely elsewhere; introduced from Europe; 10 (ii).

***Trifolium gymnocarpon* Nutt. in Torr. & Gray.** Nuttall Clover. Acaulescent to short-caulescent, 4–16 cm tall, from a caudex and taproot, the stems mainly obscured by imbricated stipules and leaf bases; petioles 1–9 cm long; leaflets 3–5, 6–23 mm long, 2–10 mm wide, elliptic to oblong, ovate, or obovate, toothed from near the base, pilosulous beneath, glabrous to pilosulous above, flat or folded, rounded to acute and apiculate; stipules scarious to herbaceous, 6–23 mm long; heads without an involucre, hemispheric, commonly 12–18 mm wide, terminal and axillary, on peduncles 1–6.5 cm long, these strigulose, erect to bent apically; flowers 6–15, the lower ones reflexed in age, the petals pink to lavender or purple, 8.5–11 mm long; pedicels 0.5–1 mm long; calyx 4.4–7 mm long, the tube 2.2–3.3 mm long, strigose, the teeth 1.8–3.7 mm long, subulate, strigose; pods 4–8 mm long, 3–4.5 mm wide. Two weak, sympatric varieties occur in Utah. They are hardly worth taxonomic recognition, but possibly represent trends.

1. Leaflets glabrous above *T. gymnocarpon* var. *gymnocarpon*
 — Leaflets pilose above *T. gymnocarpon* var. *plummerae*

Var. *gymnocarpon*. [*T. subcaulescens* A. Gray in Ives; *T. gymnocarpon* var. *subcaulescens* (A. Gray) A. Nels.; *T. nemorale* Greene]. Mixed desert shrub, pinyon-juniper, mountain brush, sagebrush, ponderosa pine, Douglas fir, and spruce-fir communities at 1570 to 2900 m in Carbon, Daggett, Duchesne, Garfield, Juab, Kane, Millard, Piute, San Juan, Sanpete, Sevier, Uintah, Utah, and Wayne cos.; Nevada, Wyoming, Colorado, Arizona, and New Mexico; 25 (x).

Var. *plummerae* (S. Wats.) Martin. [*T. plummerae* S. Wats.; *T. gymnocarpon* f. *plummerae* (S. Wats.) McDermott; *T. gymnocarpon* ssp. *plummerae* (S. Wats.) Gillett]. Sagebrush, pinyon-juniper, and other communities at 1530 to 2430 m in Beaver, Carbon, Daggett, Duchesne, Millard, San Juan, Sanpete, Summit, Uintah, Wasatch, and Wayne cos.; Oregon, Idaho, Wyoming, California, and Nevada. This phase intergrades completely with the preceding in Utah, and if recognized at any taxonomic level, should best be treated at the rank of forma, as was done by McDermott; 10 (0).

***Trifolium hybridum* L.** Alsike Clover. Caulescent, 15–70 cm tall, erect or ascending (rarely decumbent), from a caudex and taproot; petioles 0–16 cm long; leaflets 3, 5–38 mm long, 3–28 mm wide, oval to lance-elliptic, ovate or obovate, flat, toothed from near the base, glabrous on both sides, obtuse to retuse and apiculate; stipules herbaceous, 5–25 mm long; heads without an involucre, 12–25 mm wide, terminal and axillary on peduncles 1.5–13 cm long, these glabrous or glabrate, erect; flowers many, the lower reflexed in age, the petals white to pink or reddish, fading red-brown, 5–9 mm long; calyx 2.7–4 mm long, the tube 1.2–1.6 mm long, glabrous, scarious, the teeth 1–2.5 mm long, subulate, glabrous; pods 1- to 3-seeded. Cultivated, short-lived, forage plant, escaping and persisting (?) in Cache, Davis, Garfield, Piute, Salt Lake, San Juan, Sanpete, Summit, Utah, Wasatch, and Weber cos.; and perhaps universal; introduced from Europe; 21 (ii).

***Trifolium kingii* S. Wats.** King Clover. Caulescent, (2) 7–40 cm tall, erect or ascending, from a caudex and taproot; petioles 0.8–15 cm long, the longest near the base but not basal; leaflets 3, 5–80 mm long, 4–26 mm wide, elliptic to lance-elliptic or lanceolate, flat, toothed from near the base, glabrous on both sides, obtuse to acute or attenuate and apiculate; stipules foliaceous, 8–30 mm long; heads nodding to suberect, without an involucre, 15–32 mm long, 15–30 mm wide (when pressed), terminal, on peduncles 3–13 cm long, these glabrous; flowers many, reflexed, the petals violet to purplish (rarely white), 12–16 mm long; calyx 5.3–9 mm long, glabrous, the tube 2.1–3.5 mm long, the teeth 1.8–6 mm long, subulate; pods 1- to 3-seeded. Meadows and open woods at 2270 to 3700 m in Beaver, Emery, Garfield, Grand, Piute, San Juan, Sanpete, Sevier, Summit, and Utah cos.; endemic. With its nodding heads and reflexed flowers, the King clover simulates *T. eriocephalum* in all salient aspects. The main differential feature involves the pubescence of herbage and calyces in *T. eriocephalum*; 35 (v).

***Trifolium longipes* Nutt. in Torr. & Gray.** Rydberg Clover. Caulescent (rarely acaulescent), 5–31 (37) cm tall, erect or ascending from a branching caudex and stout to slender taproot; petioles 1.2–10 cm long; leaflets 3, 5–47 (57) mm long, 3–18 mm wide, narrowly oblong to elliptic, oblanceolate, or obovate, flat, toothed from near the base, pilosulous beneath, glabrous above, acute to obtuse and apiculate; stipules foliaceous, 8–40 mm long; heads erect, without an involucre, 17–31 mm long, 15–33 mm wide (when pressed), terminal, on peduncles 0.5–17 cm long, these strigulose; flowers many, finally reflexed, the petals whitish to pink or purple, 11–13 mm long; calyx 4.5–7.8 mm long, the tube 1.6–2.5 mm long, scarious, pilose distally, the teeth 2.9–5.8 mm long, pilose, subulate; pods 1- to 4-seeded. This is the common clover in mountains in Utah. There are two rather distinctive and largely allopatric varieties.

1. Leaflets of main leaves commonly more than 5 times longer than broad; roots slender, not much enlarged; plants of the Uinta, Deep Creek, LaSal, and Abajo mountains *T. longipes* var. *reflexum*
- Leaflets of main leaves commonly less than 4 times longer than broad; roots tuberous-thickened; plants mainly of southwestern Utah (also in San Juan Co.) *T. longipes* var. *pygmaeum*

Var. *pygmaeum* A. Gray in Ives. [*T. longipes* ssp. *pygmaeum* (A. Gray) J. M. Gillett; *T. longipes* var. *brachypus* S. Wats., type from St. George; *T. brachypus* (S. Wats.) Blankinship; *T. rusbyi* Greene; *T. confusum* Rydb., type from southern Utah, i.e., Sheep Range, Cedar City; *T. oreganum* f. *rusbyi* (Greene) McDermott; *T. oreganum* f. *brachypus* (S. Wats.) McDermott; *T. longipes* var. *rusbyi* (Greene) Harrington]. Alpine meadows, open woods, stream banks, and grasslands at 1830 to 3500 m in Beaver, Emery, Garfield, Iron, Kane, Piute, San Juan, Sevier, and Washington cos.; Colorado, New Mexico, and Arizona; 47 (v).

Var. *reflexum* A. Nels. [*T. longipes* ssp. *reflexum* (A. Nels.) J. M. Gillett; *T. rydbergii* Greene; *T. oreganum* var. *rydbergii* (Greene) McDermott]. Meadows, stream banks, woods, and willow communities at 1870 to 3050 m in Cache, Daggett, Duchesne, Grand, Juab (Deep Creek Mts.), Salt Lake, San Juan, Summit, Uintah, Utah, and Wasatch cos.; Oregon, Idaho, Montana, Nevada, Wyoming, Colorado, and New Mexico; 30 (iv).

***Trifolium macilentum* Greene.** Lean Clover. [*T. kingii* ssp. *macilentum* (Greene) J. M. Gillett]. Caulescent, 12–35 cm tall, ascending to decumbent, from a caudex and taproot; petioles 2–16 cm long, the longest definitely basal; leaflets, 3, 14–45 mm long, 4–25 mm wide, those of basal leaves broadly ovoid to lance-ovoid, those of cauline leaves narrowly lanceolate, flat, toothed from near the base, glabrous on both sides, retuse to obtuse, acute to attenuate and apiculate; stipules dimorphic, the lower ones scarious and very long, the cauline ones herbaceous and small; heads nodding to suberect, without an involucre, 21–40 mm long, these glabrous; flowers many, reflexed, violet to purplish, 13.5–17 mm long; calyx 4–5.7 mm long, pilose, the tube 2.2–3 mm long, the teeth 1.5–3.3 mm long, sub-

ulate; pods 1- to 3-seeded. Mountain brush, pinyon-juniper, and ponderosa pine communities at 1370 to 2270 m in western Beaver (Ostler 1276 BRY), Iron, and Washington (type from S. Utah, Palmer 90 US) cos.; Lincoln Co. Nevada. The lean clover was subordinated by Gillett (1972) within *T. kingii*, on the basis of specimens from Nevada which were mistaken for typical *T. kingii*. The lean clover is a plant of dryish hillsides at lower elevations, differing further in its strongly dimorphic leaves, flowers which average larger, and pilose (though sparingly) calyces which average shorter. Thus, it differs from *T. kingii* in about the same order of magnitude as does *T. eriocephalum*; 12 (ii).

***Trifolium nanum* Torr.** Dwarf Clover. Acaulescent, pulvinate-caespitose, 2–4 cm tall, from a caudex and taproot, the stems obscured by imbricated stipules and leaf bases; petioles 0.3–2 mm long; leaflets 3, 3–11 mm long, 1–5 mm wide, oblanceolate to obovate, toothed to entire, glabrous or with some hairs on the lower surface, folded or flat, acute to mucronate; stipules scarious to herbaceous; heads 1- to 4-flowered, with an involucre of distinct to connate bracts, terminal, sessile or on peduncles 0.3–4 cm long, these glabrate to glabrous; flowers 15–23 mm long, pale purplish (fading dark violet), erect; pedicels 1–2 mm long; calyx 5–7 mm long, tube 3.5–4 mm long, scarious, glabrous, the teeth 2.2–2.8 mm long, triangular-subulate, glabrous; pods 1- to 4-seeded. Alpine meadows at 2900 to 3730 m in Daggett, Grand, San Juan, Summit, and Uintah cos. (probable in Duchesne Co. also); Montana, Wyoming, Colorado, and New Mexico. The dwarf clover is one of our most distinctive, yet poorly collected, clovers. More work is necessary to elucidate its true range in Utah; 7 (0).

***Trifolium parryi* A. Gray.** Parry Clover. Acaulescent, or short caulescent and with

one elongate internode, 4–25 cm tall, from a caudex and taproot; petioles 0.6–13 cm long; leaflets 3, 5–43 mm long, 1.5–13 (16) mm wide, oblanceolate or obovate to elliptic or oblong, flat, toothed from near the base, glabrous on both sides, acute to obtuse and a piculate; stipules scarious to herbaceous, 6–18 mm long; heads 5- to 20-flowered, subtended by involucre bracts, terminal, on peduncles 1.8–22 cm long, these glabrous or sparingly hairy near the apex; flowers 12–17 mm long, the petals pale to dark pink-purple (fading dark violet), erect; pedicels 0–1 mm long; calyx 4–7.1 mm long, the tube 2–3.9 mm long, scarious, glabrous, the teeth 2–3.2 mm long, lance-subulate; pods 1- to 4-seeded. Alpine meadows, openings in spruce woods, and other coniferous woods, and on talus slopes at 2730 to 3800 m in Daggett, Duchesne, San Juan, Summit, Uintah, and Wasatch cos.; Montana, Wyoming, and Colorado. Our materials belong to *var. montanense* (Rydb.) Welsh stat. nov. based on *T. montanense* Rydb., Mem. N. Y. Bot. Gard. 1:263. 1900. [*T. parryi* ssp. *montanense* (Rydb.) J. M. Gillett; *T. inequale* Rydb., type from Bear River Canyon, Uinta Mts.]; 26 (iii).

Trifolium pratense L. Red Clover. Caulescent, short-lived perennial, 18–60 cm tall or more, from a taproot, erect or ascending; petioles 0.8–19 cm long; leaflets 3, 11–54 mm long, 8–28 mm wide, elliptic to lanceolate, ovate, or obovate, flat, toothed from near the base (the teeth inconspicuous), long-pilose beneath, glabrous above, obtuse to retuse; stipules scarious to subherbaceous, 10–24 mm long; head closely subtended by one or more foliose bracts, these often 3-foliolate, sessile, or spreading hairy peduncles to 3 cm long, many-flowered, 22–36 mm long, 20–34 mm wide, axillary, erect; flowers 13–20 mm long, deep red; calyx 7.5–9.7 mm long, the tube 3.2–4.1 mm long, strigose, scarious, the teeth 4.3–5.6 mm long, subulate, pilose; pods 2-seeded. Cultivated forage plant, escaping but seldom persisting, in Beaver, Box Elder, Daggett, Davis, Garfield, Kane, Millard, Salt Lake, Sevier, Summit, Utah, Wasatch, and Washington cos.; and perhaps universal; introduced from Europe; 26 (i).

Trifolium repens L. White Clover. Caulescent, 8–35 cm tall, the stems stoloniferous, creeping and rooting at the nodes, the petioles and peduncles often arising at right-angles to the stem axis, radiating from a root crown; petioles 1.8–24 cm long; leaflets 3, 5–22 mm long, 4–18 mm wide, obcordate or obovate to oval or elliptic, flat, toothed from near the base, glabrous on both sides, truncate to emarginate; stipules scarious, 3–10 mm long; heads without an involucre, many-flowered, 10–32 mm long, 15–30 mm wide, axillary, on peduncles 6–33 cm long, these glabrous or sparingly pilose, erect; flowers 5–9 (10) mm long, white or pinkish, fading brown, the lower reflexed in age; calyx 3.2–5.4 mm long, the tube 2.2–2.7 mm long, scarious, glabrous, the teeth 1–2.7 mm long, subulate, glabrous; pedicels 1–6.4 mm long; pods 1- to 3-seeded. Cultivated forage and pasture plant, now widely established in Beaver, Box Elder, Cache, Carbon, Garfield, Grand, Kane, Piute, Salt Lake, Sanpete, Sevier, Summit, Utah, Wasatch, and Washington cos. (perhaps cosmopolitan); introduced from Europe; 39 (iv).

Trifolium variegatum Nutt. in T. & G. Variegated Clover. Annual, caulescent, with prostrate to erect stems 10–40 (60) cm long; petiole 0.5–4.5 cm long; leaflets 3, 3–27 mm long, 1.5–10 mm wide, obcordate to obovate or oblanceolate, flat, sharply toothed from near the base, glabrous on both sides; stipules herbaceous, ovate, laciniately toothed; heads involucre, the involucre flaring, saucer-shaped, lobed and lacerate, 3- to 40-flowered, 6–20 mm broad, axillary on peduncles 0.8–6.5 long, these glabrous; flowers 5–12 (20) mm long, purplish, often white-tipped, fading brown, ascending to erect; calyx 5- to 20-nerved, the teeth subulate-setaceous, glabrous; pedicels very short; pods 1- to 2-seeded. Stream banks and roadsides, at 1300 to 1600 m in Cache, Salt Lake, and Weber cos.; British Columbia and Montana south to California and Nevada. Our only annual clover species is not common in Utah.

Trifolium wormskjoldii Lehm. Wormskjold Clover. [*T. involucreatum* Ortega, not Lam.; *T. willdenovii* Spreng.; *T. fimbriatum* Lindl.; *T. involucreatum* var. *fimbriatum*

(Lindl.) McDermott; *T. willdenovii* var. *fimbriatum* (Lindl.) Ewan; *T. spinulosum* Douglas ex Hook.; *T. heterodon* Torr. & Gray.] Caulescent, 12–35 cm tall or more, from a taproot, or sometimes rooting at decumbent stem bases, erect or ascending; petioles 1.2–4 cm long; leaflets 3, 6–30 mm long, 2–14 mm wide, oblanceolate to elliptic or obovate, flat, toothed from near the base, glabrous throughout; stipules herbaceous, 8–15 mm long, man-toothed; heads subtended by a toothed involucre, 20–30 mm wide, many-flowered, axillary, erect; flowers 10–18 mm long, reddish to purple; calyx 7–9 mm long, the tube 2.9–3.7 mm long, glabrous, the teeth 4.1–5.3 mm long, subulate, glabrous; pods 1- to 4-seeded. Meadows at lower middle elevations in Juab and Salt Lake cos.; British Columbia and Idaho south to California, Mexico, and New Mexico. This plant is rare in collections, yet our earliest record, that for Salt Lake Co., was collected in 1880; 2 (0).

TRIGONELLA L.

Annual or short-lived perennial, caulescent from a taproot; leaves alternate, pinnately 3-foliate, serrate in the apical one-third to one-half; stipules herbaceous, distinct, toothed or entire; flowers papilionaceous, borne in axillary racemes or subumbellately disposed; calyx 5-toothed; petals 5, yellow; stamens 10, diadelphous; pods laterally compressed, much surpassing the calyx, several seeded.

Trigonella corniculata (L.) L. [*Trifolium* (*Melilotus*) *corniculata* L.]. Annual, caulescent, 12–26 cm tall; stipules 3–6 mm long, laciniately toothed; petioles 0.5–4.5 cm long; leaflets 3, the terminal on a short continuation of the rachis, 7–20 mm long, 2.5–16 mm wide obovate to obcordate, toothed in the apical half, sparingly pilose

(mainly along veins) beneath, glabrous above, apiculate; peduncles 0.8–2.8 cm long, sparingly pilose; racemes 5- to 16-flowered, 0.8–1.4 cm long; pedicels 1–2 mm long; flowers 5.5–6.5 mm long, yellow; calyx 2.8–3.2 mm long, the tube 1.4–1.8 mm long, sparingly pilose, the teeth 1.2–1.4 mm long, subulate; pods sessile, 12–15 mm long, 2–2.5 mm wide, curved, reticulately veined, the veins leaving the margins at about right-angles, glabrous. Introduced revegetation plant, not known to persist, but to be expected, now known only from Sanpete Co.; introduced from Europe. A second species of *Trigonella* is known from Sanpete Co., also, but its identity has not been established. It differs from *T. corniculata* in its flowers being 10–12 mm long and subumbellately arranged. Further study is indicated; 2(0).

VICIA L.

Annual or perennial herbs, clambering, trailing, or climbing; leaves alternate, even-pinnately compound, the rachis terminating in a usually prehensile tendril; stipules herbaceous, entire to semi-sagittate; leaflets 4–12 or more, very variable; flowers solitary, axillary, or in axillary racemes, papilionaceous; calyx 5-toothed, obliquely campanulate to short-cylindric; petals 5, pink to white, the wings adnate to the keel; stamens 10, diadelphous; style filiform, bearded around the circumference below the stigma; pods oblong, 2- to several-seeded, the valves coiling upon dehiscence.

REFERENCE

HERMAN, F. J. 1960. Vetches of the United States—native, naturalized, and cultivated. U.S.D.A. Agr. Handb. 168: 1–84.

1. Flowers 15 or more in dense secund racemes; introduced plants of cultivated lands and other disturbed sites *V. villosa*
- Flowers 10 or fewer, in secund racemes or otherwise; introduced or indigenous plants 2
- 2(1). Flowers 5–8 mm long; plants very slender, indigenous in southern Utah *V. ludoviciana*

- Flowers 12–25 mm long or more; plants not very slender, indigenous and widespread or cultivated 3
- 3(2). Flowers 3–10 in pedunculate racemes; plants indigenous, widespread *V. americana*
- Flowers 1–3, sessile or very shortly pedunculate in leaf axils; plants uncommon, cultivated *V. faba*

***Vicia americana* Muhl. ex Willd.** American Vetch. Perennial, 12–127 cm tall, the stems glabrous or pubescent; stipules 3–10 mm long, semi-sagittate, deeply toothed in the lower portion; leaves (excluding tendrils) 2–3 cm long; leaflets 8–16, 3–44 mm long, 1–19 mm wide, linear, elliptic, oblong, ovate, lanceolate, oblanceolate, or obovate, glabrous to pubescent, acute to truncate, rounded, or retuse and apiculate, less commonly toothed apically; tendrils branched or simple; peduncles 1.8–6.7 cm long; racemes 3- to 7 (10)-flowered, the flowers spreading in anthesis; calyx 6.2–8.4 mm long, the tube 4.8–6.5 mm long, the lowermost tooth 0.7–1.9 (2.5) mm long, triangular; flowers 13–22 (25) mm long, pink to pink-purple; pods stipitate, the stipe 2.5–4.5 mm long,

the body 23–35 mm long, 6–8 mm wide, glabrous. This widespread, indigenous vetch is extremely variable with regard to leaflet length-width ratios and shape. Thickness of the leaflets and pubescence also varies considerably. Several subordinate taxa have been based on these variations, but continued recognition seems possible only when diagnostic criteria are arbitrarily applied, and even then with great difficulty, especially in plants with dimorphic leaves. More importantly, much of the variation seems to be ecologically influenced, and further recognition of most of the types seems unwarranted. Therefore, it seems best to recognize only two infraspecific taxa, the one widespread and common, the other restricted and rare.

1. Leaflets 20–40 mm long, 2–5 mm wide, coriaceous, pubescent with short curved hairs; lateral veins prominent, leaving the midrib at a narrow angle; plants of Uintah Co. *V. americana* var. *minor*
- Leaflets 3–44 mm long, 1–19 mm wide, thin or glabrous, or both; lateral veins prominent or not, leaving the midrib at a wide angle; plants throughout Utah *V. americana* var. *americana*

Var. *americana*. [V. *oregana* Nutt. in Torr. & Gray; V. *americana* var. *oregana* (Nutt.) A. Nels. in Coult. & Nels.; V. *americana* ssp. *oregana* (Nutt.) Abrams; V. *truncata* Nutt. in Torr. & Gray; V. *americana* var. *truncata* (Nutt.) Brew. in Brew. & Wats.] Sagebrush, pinyon-juniper, mountain brush, ponderosa pine, aspen, and spruce-fir communities at 1270 to 3050 m in Beaver, Carbon, Cache, Davis, Duchesne, Emery, Garfield, Iron, Juab, Kane, Millard, Morgan, Rich, Salt Lake, San Juan, Sanpete, Sevier, Summit, Tooele, Utah, Wasatch, Washington, and Weber cos.; British Columbia east to Ontario and south to Mexico, Arizona, New Mexico, Kansas, Missouri, and Virginia; 167 (xxxv).

Var. *minor* Hook. [V. *sylvatica* Nutt.; V. *sparsifolia* Nutt. in Torr. & Gray; *Lathyrus linearis* Nutt. in Torr. & Gray; V. *linearis* (Nutt.) Greene; *Lathyrus dissitifolius* Nutt. in Torr. & Gray; V. *dissitifolius* (Nutt.) Rydb.; V. *americana* var. *angustifolia* Nees in Wied.; V. *caespitosa* A. Nels.; V. *trifida* Dietr.] Pinyon-juniper and mixed desert shrub communities at 1670 to 1830 m in Uintah Co.; Alberta east to North Dakota and south to Colorado and Texas; 1 (0).

***Vicia faba* L.** Broadbean. Annual, 40–100 cm tall or more, the stems glabrous; stipules 4–15 mm long, semi-sagittate, not or only somewhat toothed; leaves (excluding tendrils) 6–14 cm long; leaflets 2–6, 30–75 (100) mm long, 13–40 mm wide, ovate-

lanceolate to elliptic or obovate, glabrous or with short curved hairs on veins and margin, obtuse to acute and apiculate; tendrils unbranched; peduncles very short or obsolete; racemes 1- to 4-flowered, the flowers erect-ascending; calyx 12-16 mm long, the short-cylindric tube 7.5-9.5 mm long, the lowermost tooth 3.5-6.5 mm long, lance-subulate; flowers 25-31 mm long, white, spotted with maroon or blackish-violet; pods sessile to substipitate, the body 70-130 mm long or more, 10-30 mm wide, glabrous. Sparingly cultivated vegetable plant, mainly for the large edible seeds, known from Wasatch Co., but to be expected in most communities in the state; introduced from Asia; 1 (1).

Vicia ludoviciana Nutt. Louisiana Vetch. [*V. exigua* Nutt. in Torr. & Gray; *V. thurberi* S. Wats.; *V. producta* Rydb.] Annual or winter annual, 30-85 cm tall, the stems glabrous or puberulent; stipules semi-hastate to linear-oblong, 1-4 mm long; leaves (excluding tendrils) 1.8-5.5 cm long; leaflets 6-10, 7-28 mm long, 0.6-4 mm wide, linear to oblong or oblanceolate, pilosulous to glabrous, obtuse to acute and mucronate; tendrils branched and prehensile; peduncles 0.4-4.8 cm long; racemes 1 (2)-flowered, the flowers ascending to spreading at anthesis; calyx 2.2-3.3 mm long, the campanulate tube 1.4-1.9 mm long, the lowermost tooth 0.8-1.4 mm long, lance-subulate; flowers 6.3-7.4 mm long, lavender; pods stipitate, the stipe 0.8-1.4 mm long, the body 16-28 mm long, 5-6.2 mm wide, glabrous. Blackbrush, creosote bush, and pinyon-juniper communities at 900 to 1730

m in San Juan and Washington cos.; Oregon, California, Nevada, Arizona, New Mexico, Colorado, and Texas; 8 (i).

Vicia villosa Roth. Hairy Vetch. Annual or biennial, 50-200 cm tall, the stems spreading-hairy; stipules toothed or entire, 5-15 mm long; leaves (excluding tendrils) 2.3-8 cm long; leaflets 10-18, 8-30 mm long, 1-6 mm wide, linear to oblong or narrowly lanceolate, long-pilose or hirsute on both sides, acute to obtuse and apiculate; peduncles 1.8-7.5 cm long; racemes mainly 15- to 25-flowered, the flowers declined at anthesis; calyx 7-7.8 mm long, the gibbous tube 3.8-4.7 mm long, the teeth 3.1-4.3 mm long, subulate, pilose; flowers 15-17 mm long, pink-purple or reddish-violet; pods 20-30 mm long, 7-10 mm wide, glabrous. Weedy introduction of cultivated lands and other disturbed sites, often along fence-rows, in Salt Lake, Utah, Washington and Weber cos., but to be expected elsewhere; adventive from Europe; 5 (0).

WISTERIA Nutt.

Twining woody vines, unarmed; leaves alternate, odd-pinnate with 7 or more leaflets; stipules ovate to lance-linear, caducous; peduncles opposite the leaves; flowers in elongate, pendulous racemes, calyx turbinate-campanulate, 2-lipped, the upper lip shortly 2-toothed, the lower 3-toothed; corolla papilionaceous, the banner strongly reflexed; stamens 10, diadelphous; petals white, pink, lavender, purple, or blue; pods stipitate, laterally flattened, constricted between the seeds.

1. Longest pedicels 12-28 mm long or more; calyx lobes very short; pods silky-to velvety-hairy *W. floribunda*
- Longest pedicels 6-11 mm long; calyx lobes almost as long as the tube; pods glabrous *W. macrostachya*

Wisteria floribunda (Willd.) DC. Japanese Wisteria. [*Glycine floribunda* Willd.; *Kraunia floribunda* (Willd.) Taub.; *W. macrobotrys* Sieb. & Zucc.] Twining vines to several meters long; leaves petiolate, 9-35 cm long; leaflets 9-15, 13-90 mm long, 9-30 mm wide, ovate to lance-oblong,

long-attenuate, pilose to glabrate or glabrous on both sides; peduncles 0.5-5 cm long; racemes pendulous, many-flowered, 25-50 cm long; flowers 15-20 mm long, white, pink, purple, or lavender; calyx tube strigulose, 3.5-4.3 mm long, the upper teeth almost completely connate, the lowermost

tooth 1.3–2.1 mm long, triangular; pods 100–180 mm long, 15–18 mm wide, tapering to the base, velvety hairy in lines. Cultivated ornamental of great beauty in both grafted and free growing forms in Utah Co., and likely in most low elevation population centers in the state; introduced from Japan; 3 (ii).

Wisteria macrostachya Nutt. Nuttall Wisteria. Freely twining vines to several meters long; leaves 15–40 cm long; leaflets 9–13, 28–90 mm long, 9–33 mm wide, ovate to lance-oblong, long-acuminate, pi-

lose along the veins beneath at maturity, pilose to glabrate or glabrous otherwise; peduncles 1–5 cm long; racemes pendulous, many-flowered, 22–55 cm long; flowers 18–22 mm long, lilac-purple; calyx tube pilosulous, 4.5–5.5 mm long, the upper teeth cleft, the lowermost tooth 5.5–6.5 mm long, ovate-acuminate; pods 70–120 mm long, 11–15 mm wide, oblong, glabrous. Ornamental of charm and beauty in Utah Co., and likely elsewhere in Utah; introduced from the southeastern United States; 3 (iii).

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